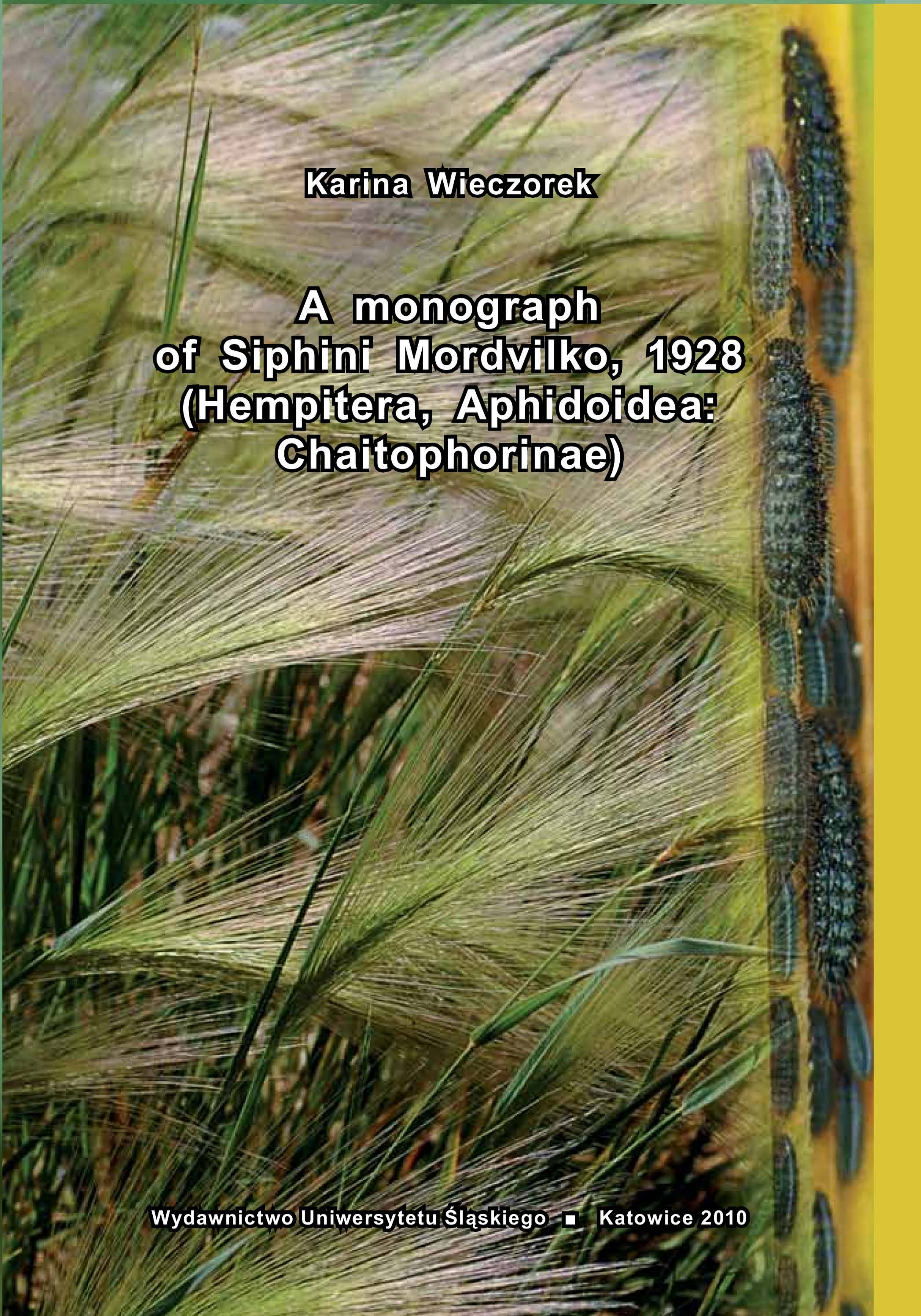
Karina Wieczorek

A monograph of Siphini Mordvilko, 1928 (Hempitera, Aphidoidea: Chaitophorinae)



Wydawnictwo Uniwersytetu Śląskiego ■ Katowice 2010

A monograph of Siphini Mordvilko, 1928 (Hemiptera, Aphidoidea: Chaitophorinae)

PRACE NAUKOWE UNIWERSYTETU ŚLĄSKIEGO W KATOWICACH

NR 2791

Karina Wieczorek

A monograph of Siphini Mordvilko, 1928 (Hemiptera, Aphidoidea: Chaitophorinae)

Wydawnictwo Uniwersytetu Śląskiego Katowice 2010

Redaktor serii: Biologia
Iwona Szarejko

Recenzent
Andrzej Warchałowski

Praca naukowa finansowana ze środków na naukę w latach 2009—2011
jako projekt badawczy

Publikacja będzie dostępna — po wyczerpaniu nakładu — w wersji internetowej:

Śląska Biblioteka Cyfrowa
www.sbc.org.pl

Contents

General part

Systematic part

Abstract

The monograph presents the tribe Siphini Mordvilko, 1928 on a worldwide scale. 5 genera, 24 species and 1 subspecies are discussed in detail. 69 morphs (apterous viviparous female, alate viviparous female, oviparous female, male) are redescribed or described and figured in detail. The keys to all known species and morphs are provided.

A new synonym is proposed: *Sipha (Rungsia) aegilopis* Bozhko, 1961 = *Sipha (Rungsia) elegans* Del Guercio, 1905.

The lectotype for *Sipha (R.) elegans* is designated.

New country records for most species are presented as well as new bionomical data for 6 species (*Atheroides serrulatus* Haliday, 1839; *Chaetosiphella stipae* Hille Ris Lambers, 1947; *Laingia psammae* Theobald, 1922; *Sipha (Rungsia) arenarii* Mordvilko, 1921; *S. (R.) elegans* and *S. (R.) maydis* Passerini, 1860). During the field study the sexuales of *Ch. stipae* were collected and have been described for the first time. There is also provided a host index compiled from the material studied and the literature cited.

The structure of reproductive system of adult males of *A. serrulatus*, *Ch. stipae*, *L. psammae*, *S. (R.) arenarii*, *S. (R.) elegans* and *S. (R.) maydis* has been studied in the light and transmission electron microscopy, as well as the morphological characters of *A. serrulatus*, *Caricosipha paniculatae* Börner, 1939, *Ch. stipae* and *S. (R.) maydis* that have been studied using SEM techniques.

All available data concerning chorology, ecology and bionomy of the species belonging to this tribe is summarized in the study, as well as the relationships within the Siphini and the genesis of this group of aphids is proposed.

Key words: Taxonomy, Hemiptera, Aphidoidea, Chaitophorinae, Siphini.

Introduction

The tribe Siphini belongs to the subfamily Chaitophorinae and encompasses an economically important group of aphids bionomically associated with grasses and sedges. In various studies on the Chaitophorinae subfamily, the Siphini are usually discussed marginally and — as opposed to the Chaitophorini — they have never been studied in detail. Little is known about the bionomy of these aphids, their distribution, ecological preferences and trophic associations. The relationships within the Siphini and the Chaitophorinae subfamily have never been analysed in detail either. Identification keys and morph descriptions, which are usually compilatory and concern mainly apterous viviparous females, can be found in regional studies from the Ukraine (MAMONTOVA 1959), Canada (RICHARDS 1972), Western Siberia (IVANOVSKAJA 1977), Great Britain (STROYAN 1977), Hungary (SZELEGIEWICZ 1977), Denmark (HEIE 1982), Poland (SZELEGIEWICZ 1985), Spain (NIETO NAFRIA, MIER DURANTE 1998) and China (QIAO, ZHANG 2002). The characteristics of individual species can be found, among others, in the studies by LAING (1920), THEOBALD (1922, 1929) and HILLE RIS LAMBERS (1939). More recent studies provide a review of species belonging to the genus *Chaetosiphella* (WIECZOREK 2008) and a revision of the genus *Atheroides* (WIECZOREK 2009). Moreover, these studies also contain descriptions of new aphid taxa belonging to the tribe in question, which, together with one species belonging to the genus *Chaetosiphella*, described by KADYRBEKOV in 2005, has increased the number of known taxa of the Siphini (in the rank of species and subspecies) to 25, grouped into 5 genera. Due to the bionomy of these aphids (they usually live in leaf sheaths or inflorescences of grasses and sedges) and difficulties encountered in their collection, probably the actual number of existing species exceeds the number of the species that have already been described.

The objective of the present monograph is to summarise and verify the contemporary knowledge on aphids belonging to the tribe Siphini. The general part of the study contains information on their systematics and morphology (including data on the male reproductive system) and their zoogeographical, ecological and bionomical characteristics, also in the context of the economic significance of these aphids as pests of cereal crops and virus vectors. Furthermore, this part of the monograph contains the reconstruction of relationships within the Siphini against the background of the Chaitophorinae subfamily, and also proposes a hypothesis about the origin of this group of aphids.

Second part of the study provides a detailed characteristics of the Chaitophorinae subfamily, the Siphini tribe and the genera belonging to it. It constitutes a complex elaboration, including identification keys for all morphs (apterous viviparous female, alate viviparous female, oviparous female and male) and their descriptions or redescriptions. Moreover, for all species there are also listed the localities where the particular species were recorded, and the host plant on which they were recorded. The monograph is illustrated with original drawings of particular morphs, as well as with maps and photographs. It also provides an alphabetical list of host plants for aphids belonging to the Siphini tribe.

Acknowledgements

I would like to thank Professor Wacław Wojciechowski for encouragements and help during my study on aphids.

I would also like to express my thanks to: Cheryl Barr, Essig Museum of Entomology, University of California, Berkeley, USA; Thierry Bourgoin, Daniele Matile-Ferrero, Georges Remaudière, Museum National d'Histoire Naturelle, Paris, France; Roma Durak, University of Rzeszów, Poland; Fernando Albano Ilharco, Estação Agronómica Nacional, Oeiras, Portugal; Boris C. Kondratieff, C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Department of Bioagricultural Sciences and Pest Management Fort Collins, Colorado, USA; Niels P. Kristensen and Lars Bjørn Vilhelmsen, Natural History Museum of Denmark/University of Copenhagen, Denmark; Jon H. Martin, Department of Entomology (Wandsworth) The Natural History Museum, London, Great Britain; Juan M. Nieto Nafría and Nicolás Pérez Hidalgo, Department of Biodiversity and Environmental Management, University of León, Spain; Ge-Xia Qiao, Institute of Zoology, Chinese Academy of Sciences, P.R. China; F. Wolfgang Quednau, Laurentian Forestry Centre, Quebec, Canada; Renato Regalin, Dipartimento di Protezione dei Sistemi agroalimentare e urbano e Valorizzazione delle Biodiversità Università degli Studi di Milano, Italy; Andrey V. Stekolshchikov, Laboratory of Insect Taxonomy, Zoological Institute of Russian Academy of Science, Saint Petersburg, Russia; Thomas Thieme, BTL Bio-Test Labor GmbH Sagerheide, Germany; Paul P. Tinerella, Illinois Natural History Survey, University of Illinois, USA; David Voegtlin, Illinois Natural History Survey, Section for Ecological Entomology National Soybean Research Center, USA; Rob de Vries, Nationaal Natuurhistorisch Museum, Leiden, the Netherlands; Vitaly Zhuravlev, Institute of Zoology, Ukrainian Academy of Sciences, Kiev, Ukraine for the loan of slides and alcohol specimens of aphids.

I am indebted to Jolanta Brożek, Department of Zoology, University of Silesia, Katowice and Jerzy A. Lis, Department of Biosystematics, University of Opole for valuable comments on cladistic analysis.

I would also like to thank Piotr Świątek, Department of Animal Histology and Embryology, University of Silesia, Katowice and Bartosz J. Płachno, Department of Plant Cytology and Embryology, Jagiellonian University, Cracow for taking the TEM and SEM micrographs as well as Krzysztof Kudła, Department of Zoology, University of Silesia, Katowice for photographs of slide-mounted aphids and Łukasz Małkowski, Department of Plant Systematics, University of Silesia, Katowice for photographs of *A. hirtellus*.

Special thanks go to Łukasz Junkiert for preparation of the drawings.

My special gratitude is due to Juan M. Nieto Nafría, Department of Biodiversity and Environmental Management, University of León, Spain for Spanish translation of Abstract.

I thank my colleagues from the Department of Zoology, University of Silesia, for their kind cooperation.

Finally, I would like to thank my parents Irena and Bogdan as well as my husband Dominik who warmly encouraged me to realize this project.

This research was supported by the Ministry of Science and Higher Education, Poland, grant no N N303 392636 for the years 2009—2011 and received support from the SYNTHESYS Project (www.synthesys.info) DK-TAF no 1086 which is financed by European Community Research Infrastructure Action under the FP6 "Structuring the European Research Area" Programme.

Material and methods

Morphology and anatomy

Insects

Adult males of *A. serrulatus*, *Ch. stipae*, *L. psammae*, *S. (R.) arenarii*, *S. (R.) elegans* and *S. (R.) maydis* were collected by the author in Poland at the end of September, in October and November in the years 2006—2009 in different localities (Dąbrowa Górnicza Pogoria IV, Owczary near Słubice, Siewierska Góra, Bukowno, Żabie Doły near Bytom and Czatachowa respectively).

Adult males of *Ch. stipae* subsp. *setosa* and *S. (S.) glyceriae* were borrowed from the aphid material preserved in alcohol, deposited in the Muséum National d'Histoire Naturelle, Paris, France.

Adult viviparous females of *C. paniculatae* were borrowed from the aphid material preserved in alcohol, deposited in the private collection of Dr Roma Durak, University of Rzeszów.

Light and electron microscopy

For a plane reconstruction of the male reproductive system the material was treated with Carnoy solution for 20—30 min. and subsequently transferred to 70% ethyl alcohol. The male reproductive systems were dissected from whole insects (total preparation) and examined using the light microscope Nikon Eclipse 600. Drawings were made with a camera lucida. For each of the drawings a magnified view is presented; the adopted scale is 0.1 mm.

For a histological analysis, specimens were dissected and body fragments with the reproductive system were fixed in 2.5% glutaraldehyde in 0.1 M phosphate buffer (pH 7.4) at room temperature for several days and, after washing in phosphate buffer, postfixed for 1 h in 1% osmium tetroxide (OsO_4) in the same buffer, dehydrated in a graded series of ethanol and acetone and then embedded in Epon 812 (Fullam Inc., Latham, NY, USA). 0.7 μm thick sections were stained with methylene blue. Semi-thin sections were examined with an Olympus BX60 microscope equipped with a DP12 digital camera (Olympus, Tokyo, Japan) and AnaliSIS 3.2 (Soft Imaging System) software.

Ultra-thin sections (70—80 nm) were cut on a Leica ultracut UCT ultramicrotome (Leica, Wetzlar, Germany). After being stained with uranyl acetate and lead citrate, the sections were examined in a Hitachi H500 electron microscope (Hitachi, Tokyo, Japan) at 75 kV.

For the scanning electron microscopic (SEM) analyses, insects were hand sectioned with a razor blade and fixed in the same manner for the purpose of transmission electron microscope (TEM) analyses, or fixed in 70% ethanol. The dried tissues were sputter-coated with gold and viewed in a Hitachi S-4700 microscope (Scanning Microscopy Laboratory of Biological and Geological Sciences, Jagiellonian University).

Cladistic analysis

Cladistic analysis included the known species of the Siphini (24 species and 1 subspecies — an ingroup) and *Periphyllus aceris* (Linnaeus, 1758) was used as an outgroup. A matrix with 28 morphological adult characters (including 2 characters based on structures of the male internal reproductive system) and 2 ecological characters was produced. Most characters were binary, with the exception of a few multistate characters.

The analysis was made using the computer program NONA, version 2.0 (GOLOBOFF 1999) together with the computer program WinClada, version 1.0 (NIXON 1999). The parameters for the heuristic search with NONA were hold/100 000, hold/100, mult*100 and TBR+max*.

Taxonomy

The material for the study was borrowed from 18 institutions. Approximately 330 slides and above 650 adult specimens (aptreous viviparous females, alatae viviparous females, oviparous females and males as well as undetermined specimens) were examined (Table 1).

Type specimens of 18 species and 1 subspecies of the tribe Siphini were analysed during the study. Locations of the types of some species (*A. hirtellus*, *A. serrulatus*, *Ch. berlesei*, *Ch. tshernavini*, *S. (S.) glyceriae*, *S. (R.) maydis*) are unknown.

The specimens were examined and photographed using the light microscope Nikon Eclipse 600. Drawings were made with a camera lucida. For each of the photographs and drawings a magnified view is provided.

Abbreviations of depositories

BMNH	— The Natural History Museum, London, UK
CAEAN	— Estação Agronómica Nacional, Oeiras, Portugal
DEIC	— Deutsches Entomologisches Institut, Eberswalde, Germany
Di.P.S.A.	— Dipartamento di Protezione dei Sistemi Agroalimentare e Urbano e Vallorizzazione delle Biodiversita, The University of Milan, Italy
EMUC	— Essig Museum of Entomology, University of California, Berkeley, USA
GMAB	— C. P. Gillette Museum of Arthropod Biodiversity Colorado State University, Fort Collins, USA
INHS	— Illinois Natural History Survey, Champaign, USA
IOZ, CAS	— Institute of Zoology, Chinese Academy of Sciences, P.R. China
LFC	— Laurentian Forestry Centre, Quebec, Canada
MNHN	— Muséum National d'Histoire Naturelle, Paris, France
MZLU	— Lund University, Lund Museum of Zoology, Lund, Sweden
RMNH	— Nationaal Natuurhistorisch Museum, Leiden, The Netherlands
UASK	— Institute of Zoology, Ukrainian Academy of Sciences, Kiev, Ukraine
UL	— University of León, León, Spain
UŚ	— University of Silesia, Department of Zoology, Katowice, Poland
ZMAS	— Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
ZMPA	— Zoological Institute, Polish Academy of Sciences, Warsaw, Poland
ZMUC	— Zoological Museum, University of Copenhagen, Copenhagen, Denmark

Abbreviations used in the descriptions and redescriptions

ant.	— antenna
ant.segm.	— antennal segment(s)
Va	— base of antennal segment V
Vb	— terminal process of antennal segment V
ARS	— apical segment of rostrum
HT II	— second segment of hind tarsus
apt.viv.fem.	— apterous viviparous female
al.viv.fem.	— alate viviparous female
ovip.	— oviparous female

Table 1. Material studied and collections where specimens are held

Siphini	Apterous female	Alate female	Oviparous female	Male
1	2	3	4	5
A. brevicornis	BMNH holotype; DEIC, MNHN, RMNH, UL, ZMPA	RMNH	BMNH*	unknown
A. doncasteri	BMNH, MNHN, ZMPA paratype; DEIC, EMUC, LFC, RMNH	BMNH	BMNH	DEIC
A. hirtellus	BMNH, EMUC, LFC, MNHN, ZMPA	BMNH	BMNH	—
A. karakumi	ZMAS holotype; UASK	—	unknown	unknown
A. persianus	MNHN holotype; UŚ	BMNH*	unknown	unknown
A. serrulatus	BMNH, MNHN, MZLU, RMNH, UL, UŚ, ZMPA, ZMUC	MNHN, RMNH, UL, UŚ, ZMPA	BMNH, MNHN, ZMUC, UŚ	BMNH, MNHN, UŚ
C. paniculatae	DEIC holotype; BMNH, MZLU, UL, ZMPA, ZMUC	DEIC, UL	BMNH, ZMUC, UL	BMNH
Ch. berlesei	BMNH, MNHN, MZLU, RMNH, ZMPA	BMNH, MNHN	BMNH, RMNH	RMNH, ZMPA
Ch. longirostris	CAEAN holotype; BMNH paratype; UŚ	CAEAN	unknown	unknown
Ch. massagetica	ZMAS paratype	unknown	unknown	unknown
Ch. stipae	BMNH, RMNH lectotype; UL, UŚ, MNHN, ZMPA	MNHN, UL, ZMPA	UŚ	UŚ
Ch. stipae subsp. setosa	MNHN holotype; UŚ	MNHN	MNHN, UŚ	MNHN, UŚ
Ch. tshernavini	BMNH, LFC, ZMPA	BMNH, LFC	unknown	unknown
L. psammae	BMNH holotype, IOZCAS, MZLU, RMNH, UL, UŚ, ZMUC, ZMPA	BMNH, MNHN, MZLU, RMNH, UL, ZMUC, ZMPA	BMNH, ZMUC, UL, UŚ	MNHN, UL, UŚ
S. (S.) agropyronensis	GMAB paratype; BMNH metatype; EMUC, MNHN	GMAB	—	unknown
S. (S.) flava	INHS paratype, lectotype; LFC, MNHN, MZLU, ZMPA, ZMUC	INHS, LFC, MNHN, ZMPA	MNHN	INHS
S. (S.) glyceriae	BMNH, MNHN, MZLU, RMNH, ZMUC, ZMPA	MNHN, RMNH, ZMPA	BMNH, ZMUC, RMNH	BMNH, ZMUC, RMNH
S. (S.) littoralis	BMNH paratype; DEIC, EMUC, MNHN, MZLU, ZMUC	BMNH*	BMNH, LFC	BMNH, LFC

cont. tab. 1

1	2	3	4	5
S. (R.) arenarii	ZMAS holotype; MZLU, UŚ, ZMPA, ZMUC	MZLU, UŚ, ZMUC	UŚ, ZMUC	UŚ
S. (R.) burakowskii	ZMPA holotype, paratype	unknown	unknown	unknown
S. (R.) elegans	DiPSA lectotype, paralectotype; BMNH, IOZCAS, MNHN, RMNH, UŚ, ZMPA, ZMUC	BMNH, MNHN, RMNH	MNHN, UŚ	MNHN, UŚ
S. (R.) maydis	BMNH, DiPSA, IOZCAS, MNHN, MZLU, RMNH, ZMPA	BMNH, MNHN, RMNH, ZMPA	BMNH, UŚ	BMNH, UŚ
S. (R.) praecocis	UASK holotype	unknown	unknown	unknown
S. (R.) taurica	UASK holotype; BMNH MNHN	BMNH*	unknown	unknown
S. (R.) uvarovi	ZMAS holotype	unknown	unknown	unknown

* During preparation of this Monograph, unfortunately, some specimens of Siphini have been overlooked. The descriptions of hitherto unknown alate viviparous female of *A. persianus*, *S. (S.) littoralis*, *S. (R.) taurica* and redescription of oviparous female of *A. brevicornis* will be published in a separate paper. The material of mentioned species is deposited in BMNH.

BMNH The Natural History Museum, London, UK; **CAEAN** Estação Agronómica Nacional, Oeiras, Portugal; **DEIC** Deutsches Entomologisches Institut, Eberswalde, Germany; **DiPSA** Dipartamento di Protezione dei Sistemi Agroalimentare e Urbano e Vallorizzazione delle Biodiversita, The University of Milan; **EMUC** Essig Museum of Entomology, University of California, Berkeley, USA; **GMAB** C. P. Gillette Museum of Arthropod Biodiversity Colorado State University, Fort Collins, USA; **INHS** Illinois Natural History Survey, Champaign, USA; **IOZ**, **CAS** Institute of Zoology, Chinese Academy of Sciences, P.R. China; **LFC** Laurentian Forestry Centre, Quebec, Canada; **MNHN** Muséum National d'Histoire Naturelle, Paris, France; **MZLU** Lund University, Lund Museum of Zoology, Lund, Sweden; **RMNH** Nationaal Natuurhistorisch Museum, Leiden, the Netherlands; **UASK** Institute of Zoology, Ukrainian Academy of Sciences, Kiev, Ukraine; **UL** University of Leon, Leon, Spain; **UŚ** University of Silesia, Department of Zoology, Katowice, Poland; **ZMAS** Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia; **ZMPA** Zoological Institute, Polish Academy of Sciences, Warsaw, Poland; **ZMUC** Zoological Museum, University of Copenhagen, Copenhagen, Denmark.

General part

Historical account

The tribe Siphini is the least studied within aphids belonging to the subfamily Chaitophorinae. The tribe name Siphini (Siphina) was first used by MORDVILKO (1928). Nevertheless, after BÖRNER'S classification (1930), the name Atheroidini has been commonly used by many authors, including the Aphid Catalogue by REMAUDIÈRE, REMAUDIÈRE (1997).

The first remark about aphids belonging now to the tribe Siphini — *Atheroides hirtellus* and *A. serrulatus* was made in CURTIS'S *Guide to an arrangement of British insects* by HALIDAY (1837). However, the author did not define the genus until 1839, when he provided its short Latin diagnosis on the basis of the dry preserved material.

In 1843, KALTENBACH described *Sipha glyceriae* and in 1848 WALKER described *Sipha littoralis*, both under the genus *Aphis*. Moreover, WALKER, on the basis of the dry material, redescribed *A. hirtellus* and *A. serrulatus* and placed these species also in the genus *Aphis*.

In 1860 a new generic name *Sipha* was created by PASSERINI; the author transferred *A. glyceriae* into this new genus and described a new species *S. maydis*. In 1874 KALTENBACH described this same species under the name *S. graminis*.

In 1884 FORBES described from Illinois, United States, a new species *S. flava* ("sorghum aphis") under the genus *Chaitophorus*. In 1909, DAVIS moved this species into the genus *Sipha* and provided a redescription of viviparous and oviparous generations, a description of the life cycle, host plants and a bibliography of literature on that data.

In 1900, DEL GUERCIO revised the genus *Sipha* and described two new species: *S. avenae* (1900a) and *S. schoutedeni* (1900b). In 1904, he described *S. berlesei* under this same genus. In 1905, the author reviewed the genus *Sipha* and described a new species (*S. elegans*) and subspecies (*S. glyceriae* var *italica*, *S. maydis* var *avenae*) as well as redescribed *S. schoutedeni*. DEL GUERCIO also provided detailed descriptions of some previously undescribed morphs, their host plants and a key to all known species of this genus.

KIRKALDY (1905) in his *Catalogue of the genera of the Hemipterous insects of the family Aphidae with their typical species, together with list of species described as a new from 1885 to 1905* listed only the genus *Sipha* (with the type species *glyceriae* Kaltenbach) in the subfamily Callipterinae, whereas the genera *Chaitophorus* (created by KOCH in 1854) and *Periphyllus* (created by VAN DER HOEVEN in 1863) were classified as belonging to the subfamily Aphidinae.

In 1911, GILLETTE described *S. agropyronensis* from Colorado, United States, under the genus *Chaitophorus*. Later this species was redescribed and transferred to the genus *Sipha* by GILLETTE and PALMER (1931).

In 1912, under the genus *Glyphina* there were described, by DAHL, two species: *G. aculeata* and *G. pilosa*. Later these species were transferred to the genera *Atheroides* and *Laingia* by BÖRNER (1952).

In 1913, BÖRNER, in his classification of aphids, put together the genera *Arctaphis*, *Chaitophorus*, *Symydobius*, *Thomasia* and *Sipha* in the group Chaitophori (tribe Callipterini, subfamily Callipterinae, family Aphididae), whereas VAN DER GOOT (1913) in *Zur Systematik der Aphiden* put the genus *Sipha* in the tribe Callipterina and the group Callipteri, and put the genus *Chaithophorus* in the tribe Aphidina and group Chaetophori. Later, in 1915, the author for the first time put together the genera: *Chaitophorus*, *Chaithophorinella* (=*Periphyllus*) and *Sipha* in the tribe Chaithophorina.

BAKER (1920), who made an important contribution to the classification of aphids, put together these genera and the genus *Atheroides* in the subtribe Chaitophorina (tribe Callipterini, subfamily Aphidinae). The latter genus was revised by LAING (1920), who studied and redescribed Haliday's specimens *A. hirtellus* and *A. serrulatus*. Moreover, among the material of *A. hirtellus*, LAING found and described two new species: *A. brevicornis* and *A. junci*.

In 1921 MORDVILKO published *Key to the aphids living on grasses and sedges of the European part of the USSR*. In the tribe Callipterea (subfamily Aphidinae) he described a few new species under the genus *Sipha: arenarii, kurdjumovi, tshernavini* and *uvarovi*. Moreover, the author synonimized DEL GUERCIO'S *S. schoutedeni* with *S. glyceriae*, *S. glyceriae* var *italica* with *S. italica*, *S. elegans* and *S. maydis avenae* with *S. maydis*, and also Kaltenbach's *S. graminis* with *S. maydis*.

In 1922 THEOBALD created a new genus *Laingia* with *psammae* as the type. In *The Plant Lice or Aphididae of Great Britain* (1929) the author put together the genera: *Atheroides*, *Laingia* and *Sipha*, with the genera *Chaitophorus* and *Periphyllus* in the subtribe Chaitophorina. He also synonimized the previously described *Sipha paradoxa* (1918) with *A. serrulatus* ("known only as a dried mass on a card and unidentifiable", 1929: 29) and *A. junci* with *A. hirtellus*. In the genus *Sipha* he recognized two species from Great Britain: *S. schoutedeni* (after DEL GUERCIO'S definition of this species (1900b), however he also supposed that *schoutedeni* should be a synonym of *S. glyceriae*: "I can see no valid reason for not taking our species to be *glyceriae*, but until things are more fixed I have adopted DEL GUERCIO'S definition", 1929: 6) and *S. littoralis*.

BÖRNER (1930) employed a new systematics of aphids on the basis of new morphological characters. In his classification the genera *Sipha*, *Atheroides* and *Laingia* (the subtribe Atheroidina), and the genera *Tranaphis*, *Chaetophorinus*, *Chaitophorus* and *Periphyllus* (the subtribe Chaitophorina) were put together in the tribe Chaitophorini, subfamily Aphidinae.

In 1933, MIMEUR created a new genus *Rungsia* with *graminis* as the type in the tribe Callipterini and the subtribe Chaitophorina.

MORDVILKO (1934) in *On the evolution of Aphids* mentioned and figured a new species of the genus *Atheroides*: *A. festucae* but without any description.

In 1939, a new genera: *Caricosipha* with *paniculatae* as the type and *Siphonella* with *graminis* as the type were created by BÖRNER, but descriptions of these new taxa were rather short and incomplete.

HILLE RIS LAMBERS, also in 1939, in his paper *On some western European aphids* published detailed redescriptions and descriptions of the so far undescribed morphs of species belonging to the genera *Atheroides* (apterous and alate female of *A. brevicornis*), *Caricosipha* (apterous and alate female and sexuales) and *Sipha*, with description of a new species *S. agropyrella*. In this paper HILLE RIS LAMBERS also created a new genus *Chaetosiphella*. The author recognized a species described by DEL GUERCIO (1904) as *Sipha berlesei* and transferred it into this new genus ("I separate this genus from *Sipha*, because of the very abnormal shape of the ultimate rostral segment" 1939: 84). Later, in 1947, HILLE RIS LAMBERS transferred to this genus *Ch. tshernavini* described by MORDVILKO (1921), also as *Sipha*. Moreover, the author, on the basis of material collected in the Valais (a dry region in the inner Alpine valleys in Switzerland) by Dr. R. STÄGER, described *Ch. stipae* and established it as a subspecies of *Ch. tshernavini*.

BLANCHARD (1939) described a new species *Sipha carrerai* and later (1944) synonimized it with *S. flava*.

WOOD-BAKER (1943—1944) in the Key to the Irish aphids mentioned a new species *Anochetium nondescriptum* which later was synonimized with *L. psammae*.

In 1944 BÖRNER divided the family Chaetophoridae into two subfamilies: Chaitophorinae (with tribes Chaitophorini and Periphyllini) and Siphinae (with genera *Atheroides*, *Caricosipha*, *Laingia* and *Sipha*).

In 1948, MORDVILKO, in opposition to the BÖRNER'S classification, transferred the genera *Atheroides*, *Laingia* and *Sipha* (subtribe Siphea) into subfamily Phyllaphidinae and tribe Phyllaphidini, whereas the genera *Chaitophorus* and *Periphyllus* were left in the subfamily Chaitophorinae. The author also gave a short description of a new species *A. karakumi*.

In 1950, MARTELLI for the first time used *Rungsia* as a subgenus of *Sipha*. He presented a detailed redescription of *S. (S.) glyceriae* and *S. (R.) maydis*, as well as considered Mimeur's *R. graminis* as a synonym of the latter.

In 1950, Börner collected and described a new species *A. stipae* from *Stipa capillata* L. in Germany. In 1952, the author published *Die Blattläuse Mitteleuropas*. As in his former classification (1944) Börner recognized in the family Chaitophoridae two subfamilies: Chaitophorinae and Siphinae. The latter was revised and some synonyms were presented (*Glyphina pilosa* Dahl, 1912 = *L. psammae*, *Glyphina acuelata* Dahl, 1912 = *A. serrulatus*, *S. agropyrella* Hille Ris Lambers, 1939 = *R. kurdjumovi*). The author also synonimized his genus *Siphonella* with *Rungsia* Mimeur, as well as raised to the species level *Ch. stipae* and synonimized *A. stipae* with the latter.

After 1950, a few new species of Siphini were described, mostly by the aphidologists from the former USSR. In 1951 Nevski described *S. brunnea* from Kazakhstan. Bozhko (1957b), in the list of aphids, but without detailed description, mentioned *Rungsia aegilopsii* from Moldova, and in 1959 *R. praecocis* and *Ch. stipifolii* were listed from the European part of USSR. In 1961, the author redescribed apterous and alate female of *R. aegilopsii* and changed the species name to *R. aegilopis*. In 1959, Mamontova, in *Grass aphids of the Ukraine* described and figured a new species *R. taurica* and reviewed and keyed species belonging to the genera: *Caricosipha*, *Laingia*, *Atheroides*, *Chaetosiphella*, *Sipha* and *Rungsia* which were collected in Ukraine. In 1960, Juchnevitsh described *A. lasiagrostites* from Kazakhstan and Narzikulov described *S. nemaydis* in 1962 and *Ch. pamirica* in 1970, both from Tajikistan. Most authors, according to Mamontova's views on the systematic position of this group of aphids (1955) put them into subfamily Atheroidinae (together with the genera *Chaitophorus*, *Neothomasia* and *Periphyllus*); only few authors (e.g. Nevski 1951; Narzikulov 1962) after Mordvilko's classification (1948) divided this group of aphids and put the described species into the subfamily Phyllaphidinae. Later, most of these new species were synonimized: *S. brunnea* with *S. maydis*, *Ch. stipifolii* with *Ch. stipae*, *A. lasiagrostites* with *A. karakumi*, *S. nemaydis* with *S. elegans* (Eastop, Hille Ris Lambers 1976) and *Ch. pamirica* with *Ch. stipae* (Eastop, Blackman 2005).

In Europe, there were also described some new species. In 1954 Ossiannilsson described *A. niger* and in 1955 on the basis of the material collected by Hille Ris Lambers in the Netherlands and by himself in Sweden, he described *A. doncasteri*. He also provided a note on the synonymy of *A. hirtellus* and synonimized *A. niger* with it. In 1965 Pintera described *A. aplangi* from Hungary, however this species was later synonimized with *A. brevicornis*.

In 1971 Paik, on the basis of alatae forms caught in yellow pan traps at Suwon and Sosa in Korea, created a new genus *Corealachnus* with *suwonensis* as a type, which was later synonimized with *A. serrulatus*.

In 1972, Holman and Szelegiewicz, in their list of aphids, but without description mentioned *S. burakowskii*, a new species from Mongolia, while the description of an apterous viviparous female of this species the authors presented in 1974.

In 2005 KADYRBEKOV described a new species *Ch. massagetica* (only apterous vivaparous female) from Kazakhstan.

Lately, some new taxa of Siphini were described: *Ch. longirostris* from Portugal and *Ch. stipae* subsp. *setosa* from France (WIECZOREK 2008) as well as *A. persianus* from Iran and Turkey (WIECZOREK 2009).

Morphological characters of the Siphini

1. The colour of live aphids

   Most species belonging to the tribe Siphini are rather dark: dark green (e.g. *Ch. tshernavini*), brown (e.g. *S. (R.) elegans*) or black (e.g. *Ch. stipae*); the most distinguishing is the colour of *S. (R.) maydis* — shining carbon black (Fig. 1a). The second group comprises species with the colour of the body either green (e.g. *S. (R.) uvarovi*, *L. psammae* Fig. 1b), or yellow (e.g. *S. (S.) flava*), or being a combination of these two colours (e.g. *S. (R.) arenarii* Fig. 1c). Usually oviparous females have a similar colour as apterous viviparous females, the alatae forms have dark head and thorax with a pale abdomen (usually green or yellowish with darker stripes), whereas males are dark brown or black.

2. Body length and shape

   The Siphini are medium-sized aphids with the body length between 1.12 mm and 2.70 mm. The biggest morph is the apterous viviparous female, e.g. *L. psammae* — 2.70 mm long, *Ch. longirostris* — 2.65 mm long, *S. (S.) glyceriae* — 2.50 mm long. In most species oviparous females have similar size as apterous viviparous females, whereas alatae are a bit smaller (e.g. *A. serrulatus* apterous viviparous female — 1.70—2.20 mm long, alate female — 1.70—1.85 mm long, oviparous female — 2.00—2.35 mm long, *S. (R.) elegans* apterous viviparous female — 1.72—2.15 mm long, alate female — 1.77—1.95 mm long, oviparous female — 1.85—2.04 mm long). The smallest morphs are males with the body length between 1.12 mm in *S. (S.) flava* and 1.63 mm in *S. (S.) littoralis*.

   Most representatives of the Siphini are characterized by the body which is ellipsoidal (e.g. *Ch. longirostris*), oval (e.g. *S. (S.) flava*, *S. (R.) uvarovi*), or pear-shaped (e.g. *C. paniculatae*, *Ch. stipae*), and most often dorsally flattened (genus *Sipha*). Only some species belonging to the genus *Atheroides* and *L. psammae* have the elongated, narrow body.

3. Sclerotization and cuticular surface

   Representatives of the Siphini are characterized by strongly sclerotized bodies and abdominal tergites I—VII (in *C. paniculatae* Fig. 2a) or II—VII (other representatives of the Siphini, e.g. *S. (R.) maydis* Fig. 2b) fused as a dorsal sclerotic carapace. Only in *A. karakumi* the abdominal tergites are fused partially, with distinct membranous intersegmental lines between tergites I and II, wheras in *L. psammae* all abdominal tergites are free, partially membranous with visible intersegmental lines. In apterous viviparous females dorsal tergites usually are either not pigmented, or all surface of the cuticle is dark brown to black (e.g. *A. brevicornis*, *S. (R.) maydis*) or, as in *C. paniculatae*, blackish with a paler, not pigmented longitudinal stripe. In alatae viviparous females abdominal tergites I—V or VI are characterized by large, oval marginal sclerites and more or less fused pleural and spinal sclerites as large transverse plates (cross bars) and tergites VII—VIII with fused marginal, pleural and spinal ones which are dark pigmented (Fig. 3a). In oviparous females and males dorsal abdominal tergites usually are characterized by marginal pleural and spinal dark pigmented sclerites (Fig. 3b).

In most species of the Siphini the cuticular surface of the body is smooth (e.g. the subgenus *Rungsia*, most species of the genus *Atheroides* and *Chaetosiphella* Fig. 4a), whereas *A. brevicornis*, *A. persianus*, *A. serrulatus* and *Ch. tshernavini* are characterized by the distinct, rugose sculpture (Fig. 4b). In some species (e.g. Palaearctic representatives of the subgenus *Sipha* and *C. paniculatae*) the body is densely covered with rows of short spinules (Fig. 4c) which, in *L. psammae*, form a reticulated pattern (Fig. 4d). The sculpture is more visible in apterous morphs.

4. Hairs

Shape, number, position and length of dorsal hairs is one of the most important diagnostic values for the Siphini. Almost all species belonging to this tribe are characterized by numerous hairs, which more often than not are arranged on the abdominal tergites in visible marginal, pleural and spinal rows. In most species hairs are pointed, thorn-like, placed on wart-like bases (e.g. genus *Sipha*, *C. paniculatae* Fig. 5a). Sometimes among these hairs there are numerous, much shorter setae (Fig. 5b). The most variable shape of hairs we can observed in the genera *Atheroides* and *Chaetosiphella* — some species (e.g. *A. doncasteri*, *Ch. berlesei*, *Ch. massagetica*) have only hairs with pointed apices, whereas in others representatives of these genera (e.g. *A. brevicornis*, *A. serrulatus*, *Ch. longirostris*, *Ch. stipae*) dorsum is covered by hairs with blunt (Fig. 5c), forked (Fig. 5d) and jagged apices (Fig. 5e); *Ch. tshernavini* has short fan-shaped (flabellate) hairs (Fig. 5f). In alatae and sexuales hairs are usually less numerous, shorter and thinner than in apterous viviparous females.

5. Head

The Siphini are characterized by the frons more or less convex or almost flat without any tubercles. The head is not fused with prothorax, with the exception of apterous morphs of *C. paniculatae* (Fig. 6a) and *Ch. tshernavini* where it is completely fused. In apterous viviaprous females of *S. (R.) arenarii* the head is partially fused with prothorax by means of intersegmental membrane.

6. Eyes

Aphids belonging to the tribe Siphini have well-developed compound eyes with a distinct ocular tubercle (triommatidion) at its posterior margin (Fig. 6b). Only *C. paniculatae* has eyes located at lateral extensions of the head (Fig. 6c).

7. Antennae

The Siphini have 5-segmented antennae (Fig. 7a). The only exception is *A. brevicornis* — in some specimens of this species the antennae are 4-segmented (segments III and IV are connected Fig. 7b). The antennae are usually short, reaching to the posterior margin of prothorax or mesothorax. The antennae in the representatives of the genus *Atheroides* (e.g. *A brevicornis*) and *L. psammae* are rather short, about 0.12—0.25 times the body length, whereas in the genera *Chaetosiphella* and *Sipha* they are longer, about 0.25—0.50 times the body length. The longest antennae are characteristic of *C. paniculatae* (they are reaching to abdominal segment II) and *S. (S.) flava* (in females reaching to the posterior margin of metathorax, in males antennae are as long as the body). Shorter antennae are characteristic of apterous viviparous females and oviparous females, whereas males usually have antennae almost twice as long; alatae females have antennae which are longer than the antennae of apterous females and shorter than, or as long as the antennae of males (e.g. *A. serrulatus* 0.39 mm long in apterous viviparous female, 0.75 mm long in alate viviparous female, 0.46 mm long in oviparous female, 1.03 mm long in male; *Ch. berlesei* 0.47 mm long in apterous viviparous female, 0.62 mm long in alate viviparous female, 0.52 mm long in oviparous female, 0.89 mm long in male). In most species of Siphini the terminal process is as long as the base or a bit longer (genera *Atheroides* and *Chaetosiphella* Fig. 7c), whereas in *C. paniculatae* it is very long (more than 3 times the length of the base Fig. 7a). The most variable length of the terminal process can be observed in the genus *Sipha*: as long as the base or a bit longer (Palaearctic representatives of the subgenus *Sipha*) or 1.30—2.50 times as long as the base in others species of this subgenus. *L. psammae* also has the terminal process which is longer than the base.

The oval secondary rhinaria are present in alatae viviparous females on the antennal segment III, and in males on the antennal segments III and IV. In alatae females the antennal segment III bears 2—13 oval rhinaria lying in the row in the inner margin of the segment (Fig. 7c), whereas in males they are numerous, i.e. about 20—56, and not lying in a row on the antennal segment III, and 5—22 on the antennal segment IV (Fig. 7d). Less numerous rhinaria can be observed in *L. psammae*, i.e. 3 in alatae females and about 20 in males.

In the Siphini, the antennal chaetotaxy is well developed, hairs are long, thorn-like and erected (genera *Caricosipha*, *Chaetosiphella* and *Sipha*). Some species of the genus *Atheroides* (e.g. *A. brevicornis*, *A. serrulatus*) and *L. psammae* have antennal hairs which are not numerous, short and sometimes with blunt or forked apices.

In all morphs the round accessory rhinaria without cilia are placed close to the primary rhinarium on the antennal segment Va (Fig. 7e).

8. Rostrum

The Siphini are characterized by a rather short rostrum. In most species the apex of the rostrum is reaching to middle coxae and is short (0.05—0.12 mm long) and blunt (Fig. 8a) with 2 accessory hairs or without accessory hairs. Only in some representatives of the genus *Chaetosiphella* the rostrum is long, reaching to or above hind coxae, with the apical segment long (0.20—0.27 mm long) and stiletto-shaped (Fig. 8b).

9. Legs

Within the Siphini hind legs are usually longer than fore and mid legs. In most species they are 0.075—1.50 mm long. Only in some representatives of the genus *Chaetosiphella* they are longer, about 1.80 mm long (e.g. *Ch. longirostris*), and darker than fore and mid legs. The numbers of setae on the first tarsal segments are 3:3:3, 4:4:4 or 5:5:5; empodial hairs are pointed (Fig. 9a), narrow spatulate (Fig. 9b) or wide spatulate (Fig. 9c). Legs are usually hairy, some hairs, e.g. in the species with not only pointed hairs on the dorsum, have forked apices (e.g. *Ch. stipae*).

Oviparous females usually have slightly swollen hind tibiae, with numerous (4—67) 8-shaped (Fig. 9d), roundish (subgenus *Rungsia* Fig. 9e) or irregularly shaped pseudosensoria, e.g. *S. (S.) littoralis*. These structures are located on the whole surface of the tibiae or only in their middle part.

Distal parts of the tibiae are smooth; only in *C. paniculatae* there are rows of short spinules (Fig. 9d).

10. Wings

In the Siphini alatae females are rather rare, and in some species have never been described (e.g. *A. persianus*, *Ch. massagetica*, *S. (R.) uvarovi*). Wings are usually pale with slightly pigmented pterostigma. Fore wings are typical (Fig. 10a), 1.80—2.50 mm long; only in *L. psammae* the wings are narrower than in other representatives of the tribe (Fig. 10b). Media with 3 branches or, as in *C. paniculatae*, with 2 branches. Hind wings with normal venation (Fig. 10c).

11. Siphunculi

Within the Siphini only *C. paniculatae* and *L. psammae* have siphunculi located on the anterior margin of abdominal segment VI; in genera *Atheroides*, *Chaetosiphella* and *Sipha* they are placed on the abdominal segment V. The siphunculi are pore-shaped (*Atheroides*, *Laingia*) (Fig. 11a), or slightly elevated (in the genera *Chaetosiphella* and

Sipha they are more elevated in alatae females) with the surface usually smooth (Fig. 11b); however in some representatives of the subgenus *Sipha* the surface of the siphunculi is densely covered with rows of short spinules. Only in some representatives of the subgenus *Rungsia* (e.g. *S. (R.) maydis* Fig. 11c) and especially *C. paniculatae*, the siphunculi are stump-shaped with distinct flange apically (Fig. 11d).

The siphunculi are always characterized by the absence of reticulation.

12. Cauda

Most species belonging to the Siphini are visited by ants so their cauda is rather short, and, in most representatives of the tribe broadly rounded (Fig. 12a), or knobbed, as in *C. paniculatae* (Fig. 12b) and in subgenus *Sipha*. Moreover, in almost all species of the genus *Atheroides*, the cauda is hardly visible being covered by the semicircular abdominal tergite VIII.

13. Anal plate

In Siphini the anal plate is rounded, only in *C. paniculatae* is slightly emarginate. It is characterized by 4 rudimentary gonapophyses.

14. External genital organs of males

The male genitalia are usually well developed: the claspers are rather large, separate, setose and the valves are strongly sclerotized (Fig. 13a), the aedeagus (penis) is also large and its membanous apical part is usually S-shaped (Fig. 13b). Only males of *L. psammae* are characterized by genitalia which are not distinctly developed, with claspers small and slightly sclerotized (Fig. 13c).

Among other characters useful both in the phylogeny and as diagnostic characteristics, the Siphini are characterized by the lack of wax gland plates (both in viviparous and oviparous generations) as well as the absence of tubercles on thorax or abdomen.

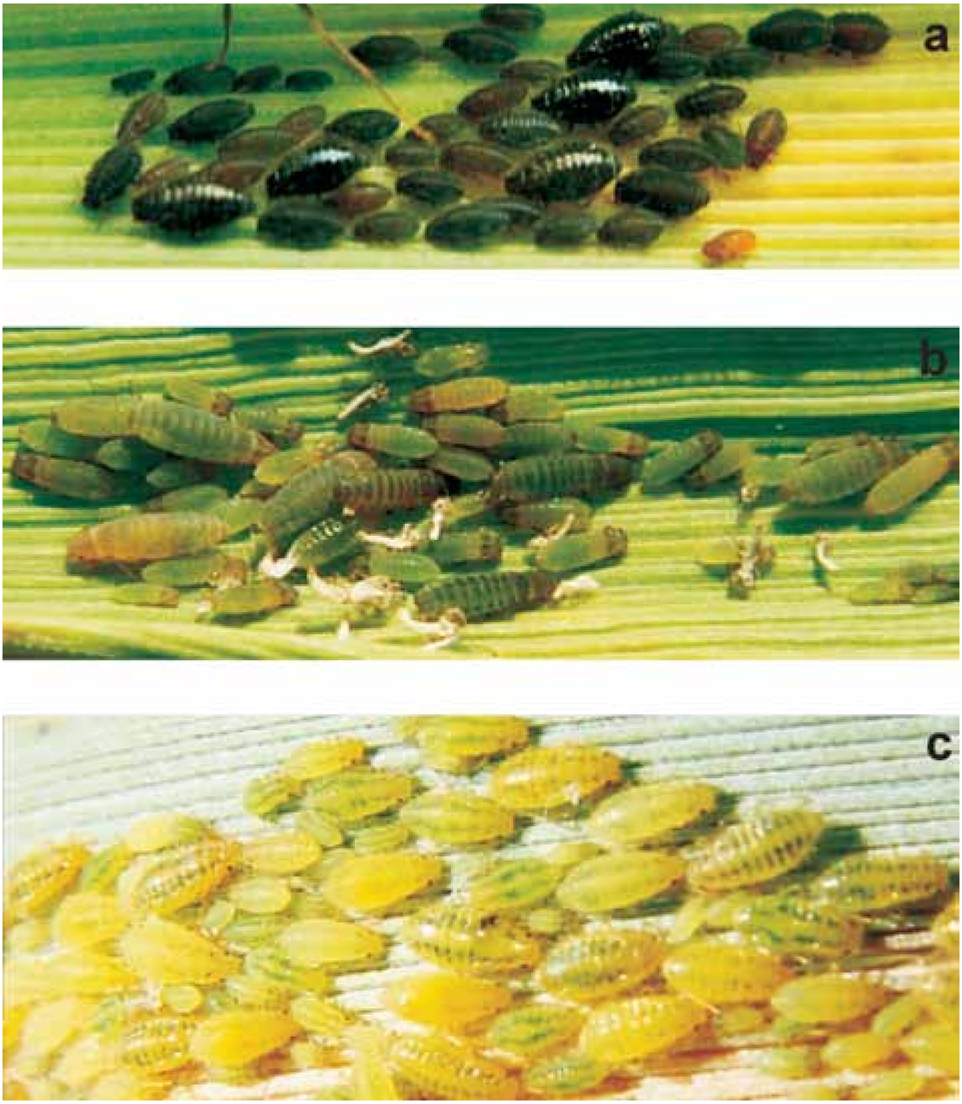


Fig. 1. The colour of live aphids:
a — *S. (R.) maydis*, **b** — *L. psammae*, **c** — *S. (R.) arenarii*

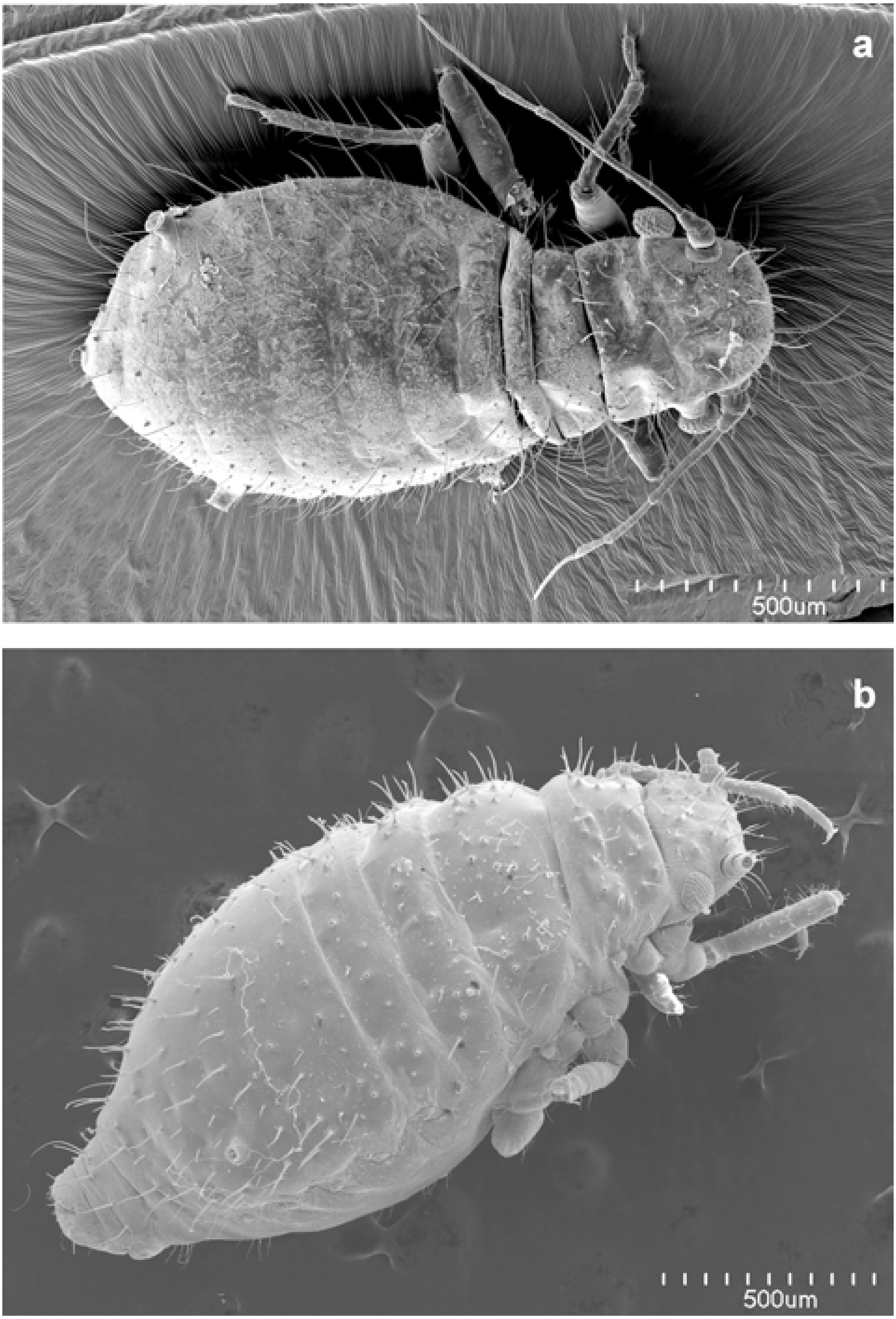
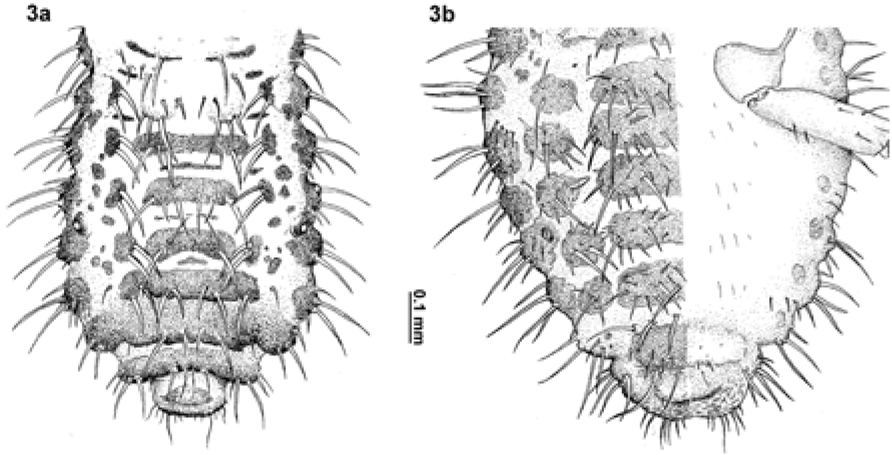
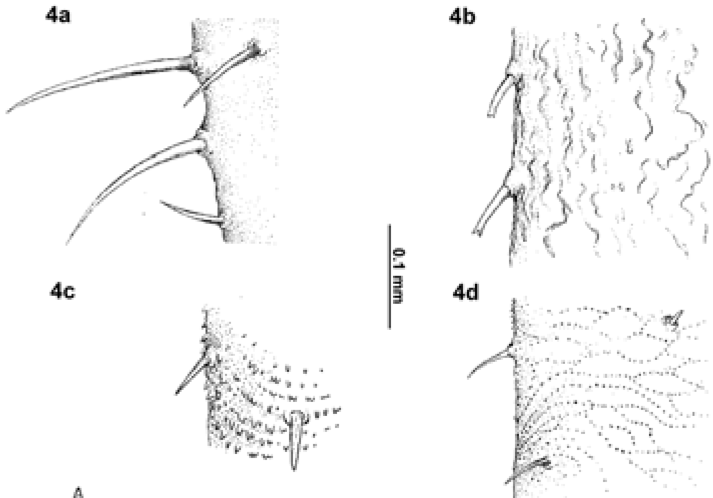


Fig. 2. General morphology:
a — *C. paniculatae* — apterous viviparous female, **b** — *S. (R.) maydis* — apterous viviparous female. Scanning electron microscopy (SEM)





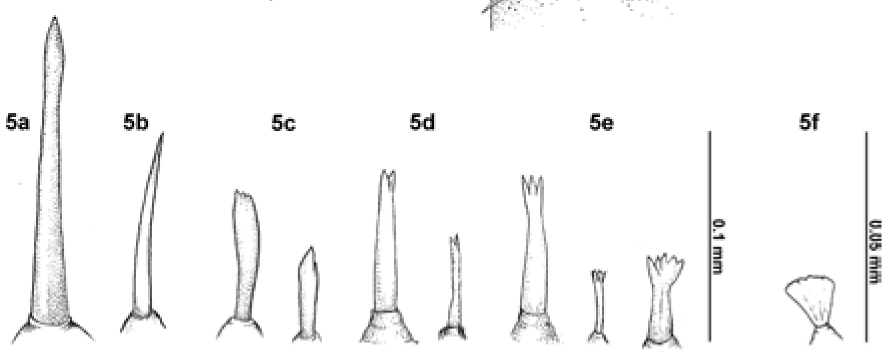


Fig. 3. Sclerotization of the abdominal tergites:
a — *Ch. berlesei* — alate viviparous female, **b** — *Ch. berlesei* — oviparous female

Fig. 4. Sculpture of the body:
a — smooth *S. (R.) arenarii*, **b** — rugose *A. serrulatus*, **c** — spinulose *S. (S.) littoralis*, **d** — reticulate *L. psammae*

Fig. 5. Dorsal hairs of the body:
a — pointed, long *C. paniculatae*, **b** — pointed, short *C. paniculatae*, **c** — blunt *A. serrulatus*, **d** — forked *Ch. stipae*, **e** — jagged *Ch. stipae*, **f** — fan-shaped *Ch. tshernavini*

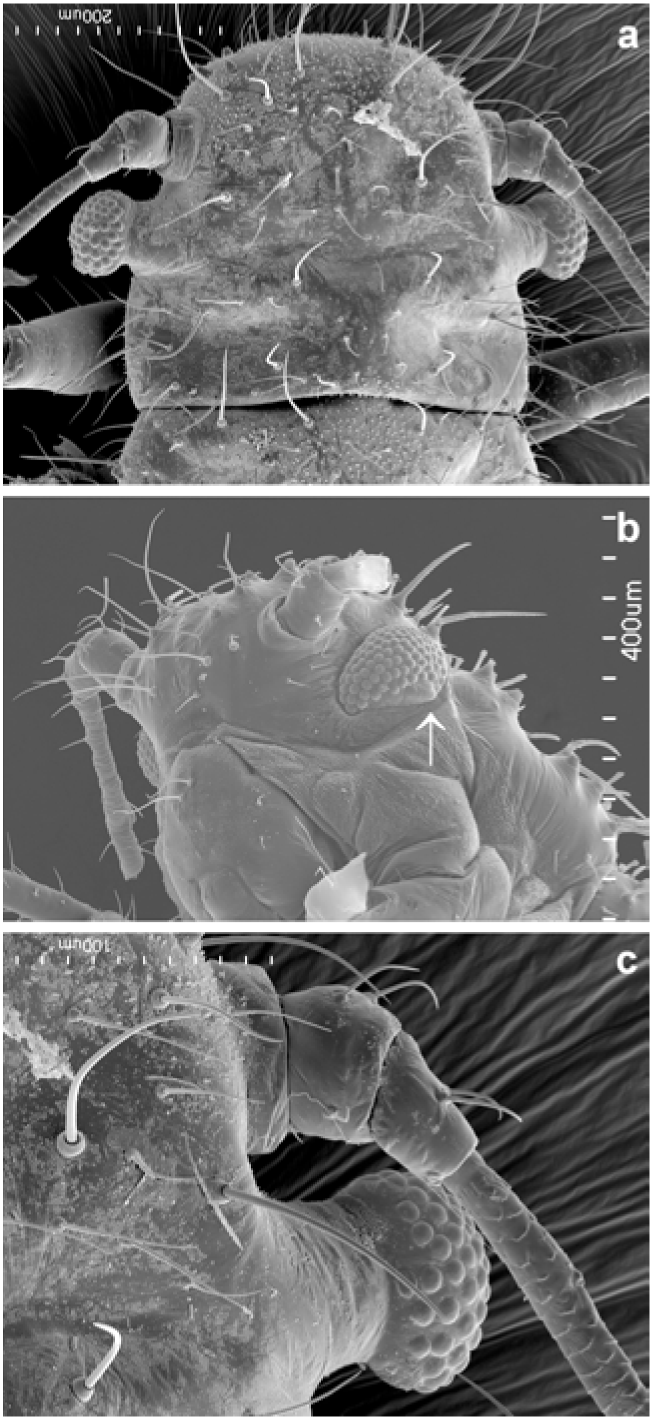


Fig. 6. Head and eyes:
a — head fused with prothorax *C. paniculatae*, **b** — compound eyes with distinct ocular tubercle (↑) *Ch. stipae*, **c** — eyes located at lateral extensions of the head *C. paniculatae* (SEM)

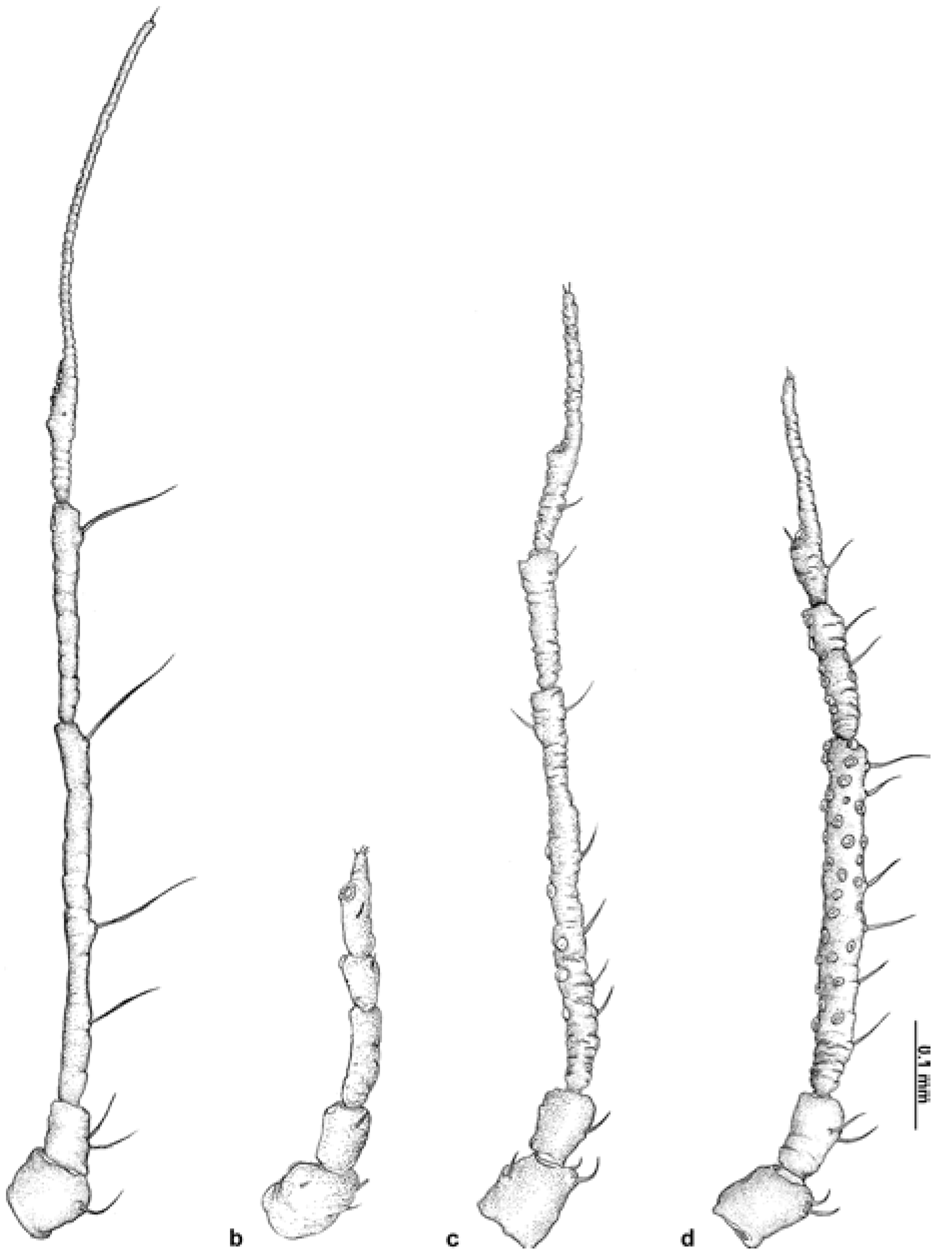
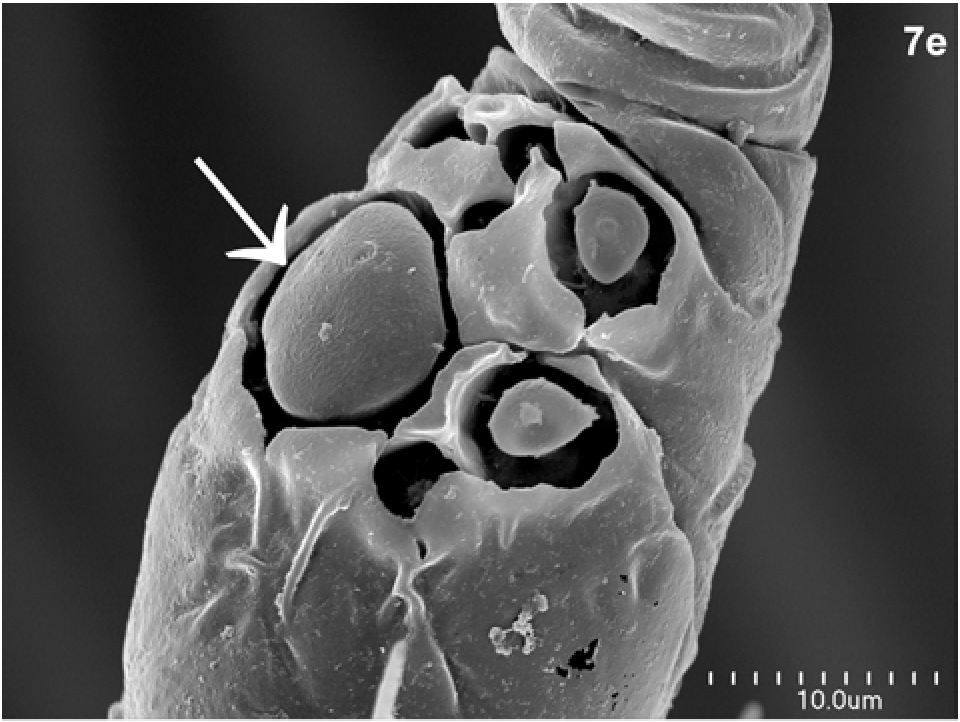


Fig. 7. Antenna:
a — 5-segmented in apterous viviparous female *C. paniculatae*, **b** — 4-segmented in apterous viviparous female *A. brevicornis*, **c** — alate viviparous female *Ch. stipae*, **d** — male *Ch. stipae*



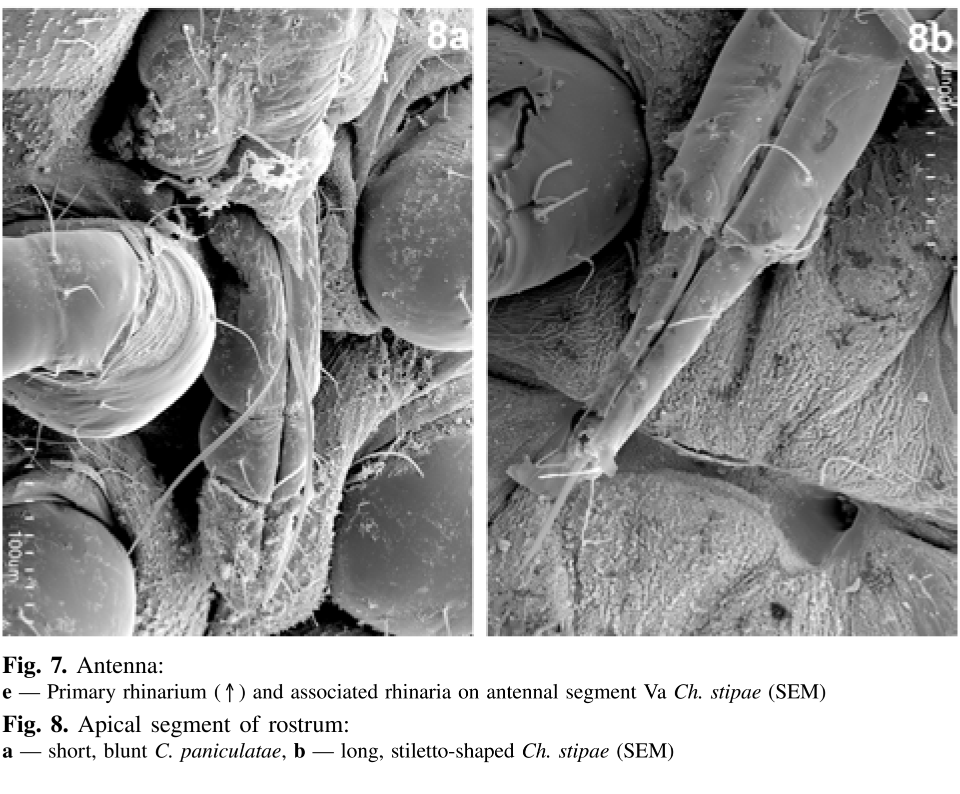


Fig. 7. Antenna:
e — Primary rhinarium (↑) and associated rhinaria on antennal segment Va *Ch. stipae* (SEM)

Fig. 8. Apical segment of rostrum:
a — short, blunt *C. paniculatae*, **b** — long, stiletto-shaped *Ch. stipae* (SEM)

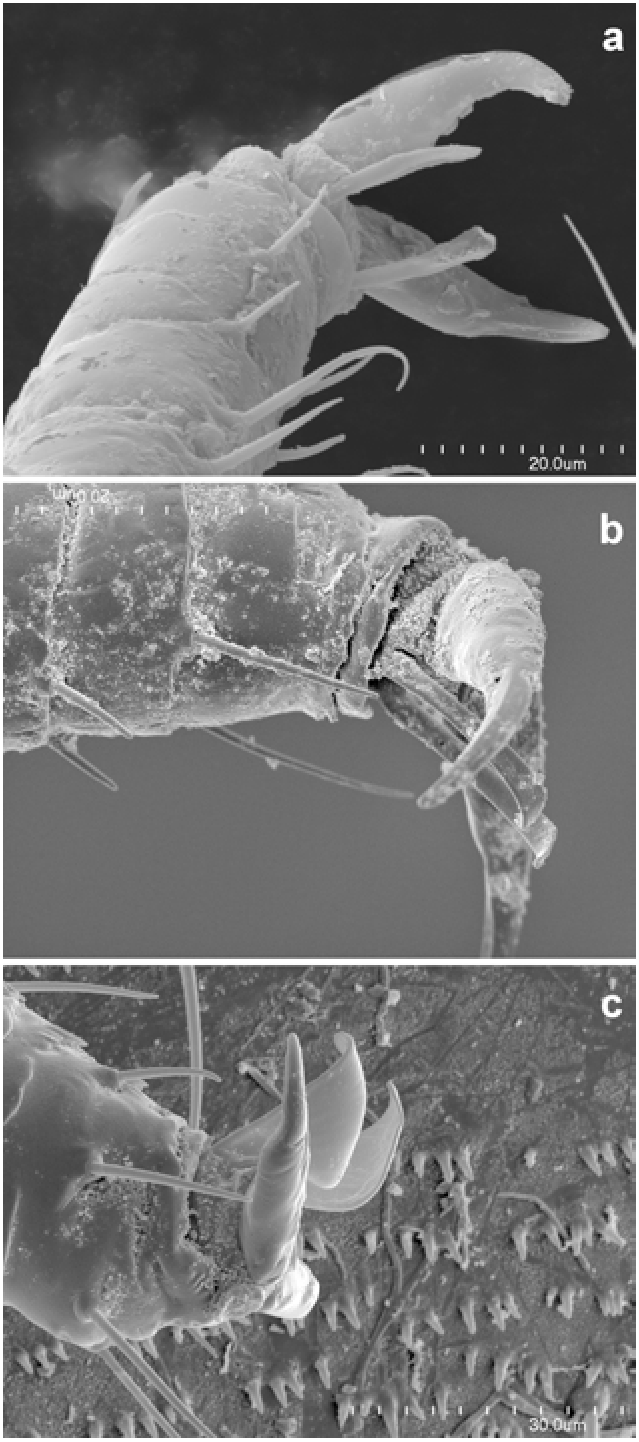
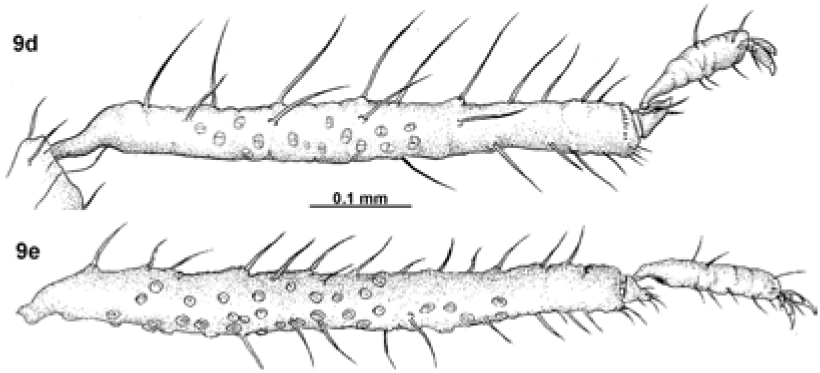
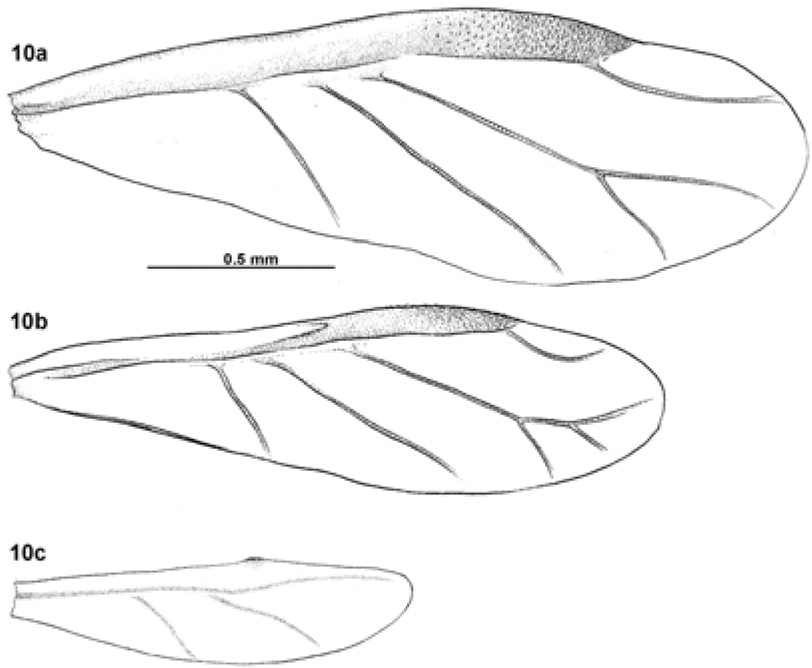


Fig. 9. Empodial hairs:
a — pointed *S. (R.) maydis*, **b** — narrow spatulate *Ch. stipae,* **c** — wide spatulate *C. paniculatae* (SEM)





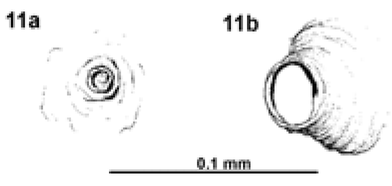
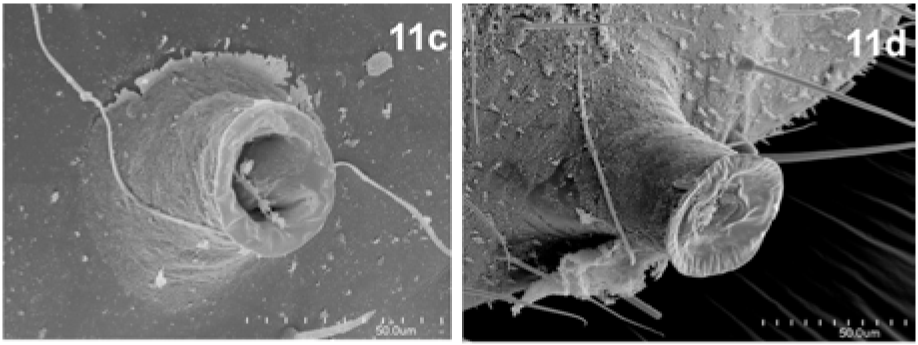
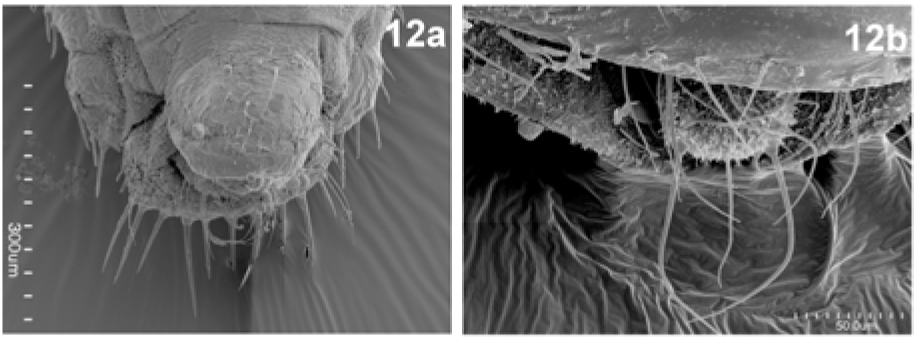


Fig. 9. Hind tibia and tarsus of oviparous female:
d — 8-shaped pseudosensoria and rows of short spinules on distal part of tibia *C. paniculatae*, **e** — roundish pseudosensoria and smooth distal part of tibia *S. (R.) elegans*

Fig. 10. Wings:
a — fore with rounded apex, media with 2 branches *C. paniculatae*, **b** — fore with narrow apex, media with 3 branches *L. psammae*, **c** — hind with 2 branches *L. psammae*

Fig. 11. Siphunculus:
a — pore-shaped *A. serrulatus*, b — sligtly elewated *S. (R.) arenarii*





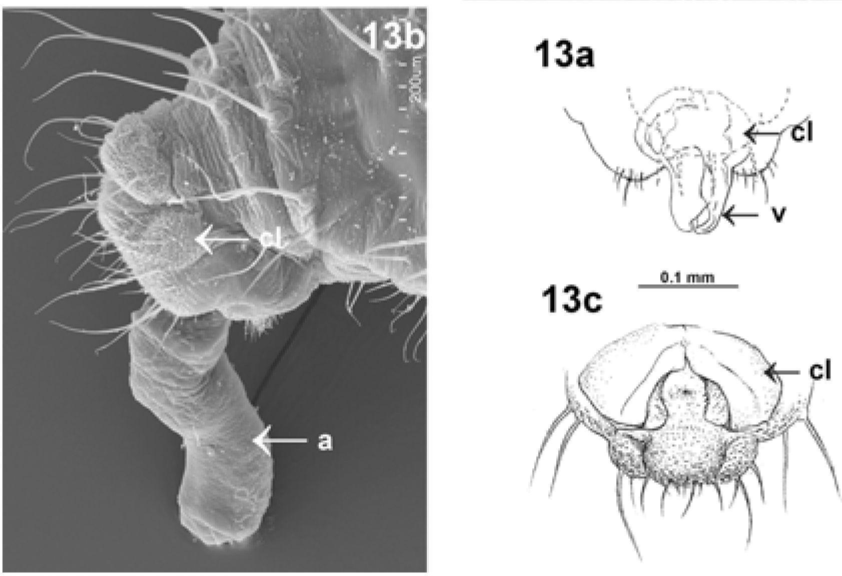


Fig. 11. Siphunculus:
c — sligtly elewated with surface smooth *S. (R.) maydis*, d — stump-shaped with surface densely covered with rows of short spinules and flange apically *C. paniculatae* (SEM)

Fig. 12. Cauda:
a — broadly rounded *A. serrulatus*, **b** — knobbed *C. paniculatae* (SEM)

Figs 13. The male genitalia:
a, **b** — strongly sclerotized, well developed with distinct claspers (**cl**) and valves (**v**); the aedeagus (**a**) S-shaped *S. (R.) maydis* (SEM); **c** — weakly sclerotized, not disctinctly developed with claspers small *L. psammae*

The male reproductive system

Among Hemiptera, aphids have a special status because of their high polymorphism and a distinctive mode of reproduction — the cyclical parthenogenesis. A complete life cycle (holocycle) of most aphids is started by a viviparous female — the fundatrix, then continued through several generations of apterous or alatae viviparous females, and finished by the appearance of sexuales — oviparous females and males.

Sexuales of most species of aphids, unlike sexual forms of other Hemiptera, are only produced once per year and have to mature quickly. Sexuales of the Siphini (oviparous apterous females and apterous males) are very rare, and in some species have never been described (e.g. in most species of the genera *Atheroides*, *Chaetosiphella* and in some species of the genus *Sipha*). They occur in the middle of September and usually are observed till the end of October and the beginning of November, however, in some species, oviparous females are produced earlier than male forms and appear at the beginning of September (e.g. *S. (R.) maydis*, pers. observ.). Usually, a small number of males, in comparison to oviparae, is observed, but they are more mobile.

The structure of the reproductive system can make an important contribution to the modern taxonomical researches and the phylogeny of aphids. The structures of the male internal reproductive system of about 80 species of aphids have been studied so far (Klimaszewski et al. 1973; Głowacka et al. 1974a, b; Bochen et al. 1975; Wojciechowski 1977; Wieczorek 2006, 2008; Wieczorek, Wojciechowski 2004; Wieczorek, Świątek 2008, 2009), whereas the general structure of the male reproductive system of the Siphini has been known only in 1 species — *Sipha (R.) maydis* and was examined by the light microscopy only (Wieczorek, Wojciechowski 2004).

The male reproductive system of aphids is composed of paired testes (*testes*) which hold follicles of different shape and size. In aphids the oligomerisation of testis follicles is common (7—1 follicles per testis, their number is usually stable on the genus level), however in some species only 1 testis is observed. The follicles are connected with vasa deferentia by vasa efferentia (*vasa eferentia*). Vasa deferentia (*vasa deferentia*) run independently along the whole length or the walls of their proximal part cling together distally. Paired accessory glands (*glandulae accesoriae*) are well developed and perform an excretory function along their length. The ejaculatory duct (*ductus ejaculatorius*) is usually shortened and located within the penis, with which it is connected. The male reproductive system of aphids, in comparison with other groups of Hemiptera, is characterized by the lack of vesiculae seminalis and a disordered arranging of the spermatids, typical for aphids.

Genus *Atheroides* Haliday, 1839

Atheroides serrulatus Haliday, 1839 (Fig. 14)

Testes consist of 3 follicles each which run parallel to each other and to the long body axis. They are strongly elongated, (about 100 µm long, one of them is much longer — 125—130 µm long) and 45—60 µm wide. The proximal part of all follicles are shifted towards the thorax and usually overlapping. Vasa deferentia are 250—325 µm long and are expand in proximal part to 25—30 µm, while in the middle and distal portion their diameter is reduced by half. Accessory glands are club-shaped and strongly elongated (375—400 µm long), their length equals the length of the entire reproductive system. Proximal portion of accessory glands are expanded to 50 µm, further their diameter is about 15 µm. The ejaculatory duct is not well defined, in its apical part the outlets of accessory glands are situated, while the outlets of vasa deferentia are located laterally.

Genus *Chaetosiphella* Hille Ris Lambers, 1939

Chaetosiphella stipae Hille Ris Lambers, 1947 (Fig. 15)

Males of this species also have 3 follicles in a testis 125—175 µm long and 60—75 µm wide. Follicles are arranged in a rosette, 1 of them is usually longer and shifted towards the thorax, whereas 2 are shorter and shifted towards the abdomen. Vasa deferentia are about 250—300 µm long, only in the proximal part they are sligtly expanded to 30 µm, in the middle and distal portion their diameter is reduced by half. Accessory glands are club-shaped, elongated and of various size. One of them is usually much longer as the other (300 µm and 225 µm, respectively) and reaches to the half part of the longest follicle towards the thorax. The width of the proximal, expanded part is about 40 µm, further the diameter of accessory glands is reduced by half. Accessory glands and vasa deferentia in the abdomen and inside the penis run separately, opening to the reduced ejaculatory duct in its apical part.

Chaetosiphella stipae subsp. *setosa* Wieczorek, 2008 (Fig. 16)

The structure of the male reproductive system in this species resembles that in *Ch. stipae*, except that the absolute measurements of particular structures (the length and width of testis follicles, the length and diameter of vasa deferentia and accessory glands) are slightly smaller. An exception is a shape of accessory glands (sack-shaped) and stable diameter of vasa deferentia on the whole of their length (about 25 µm).

Genus *Laingia* Theobald, 1922

Laingia psammae Theobald, 1922 (Fig. 17)

Testes holding 3 follicles lie in the central part of the abdomen. Follicles (125—50 µm long and 15—25 µm wide) are elongated, finger-like, with apices directed towards the thorax. The total length of vasa deferentia is about 225 µm, and they are expanded in 1/3 of their length to 30 µm, further their diameter is stable (about 15 µm). Accessory glands are sack-shaped and rather short (about 225 µm), the width of the proximal part is about 20 µm, further the diameter is about 15 µm. Accessory glands in their terminal parts enter the short ejaculatory duct independently and centrally compared to the outlets of vasa deferentia.

Genus: *Sipha* Passerini, 1860 s. lat.

Subgenus *Sipha* s. str.

Sipha (Sipha) glyceriae (Kaltenbach, 1843) (Fig. 18)

Each testis holds 3 follicles arranged in a rosette. Usually one of testis follicles is pointed, strongly elongated (about 275 µm long and 75 µm wide) and shifted towards the thorax, wheras 2 of them are oval and smaller (100—150 µm long and about 100 µm wide). The total length of vasa deferentia is about 250 µm, and their diameter is usually stable (15—20 µm), only the short, proximal part is slightly expanded to 30 µm. Accessory glands are sack-shaped, elongated (275—300 µm) and expanded only in the proximal part to 50 µm. The ejaculatory duct is reduced, the outlets of accessory glands and vasa deferentia open to it separately.

Subgenenus *Rungsia* Mimeur, 1933

Sipha (Rungsia) arenarii Mordvilko, 1921 (Fig. 19)

Testes consist of 3 follicles of similar, elongated shape (about 140—200 µm long and 50—60 µm wide). The proximal part of 2 follicles is shifted towards the thorax, 1 follicle towards the abdomen. Vasa deferentia are 250—300 µm long and usually are not expanded; their diameter is about 10—15 µm. Accessory glands are club-shaped and short, one of them is usually longer as the other (225 µm and 175 µm, respectively). Proximal portion of accessory glands, especially the longer one are expanded to 30 µm, further their diameter is about 15 µm. Accessory glands and vasa deferentia in the abdomen and inside the penis run separately, opening to the reduced ejaculatory duct.

Sipha (Rungsia) elegans Del Guercio, 1905 (Fig. 20)

Testes holding 3 follicles, round-shaped and rather small (60—75 µm long and 40—75 µm wide) arranged in a rosette. The total length of vasa deferentia is about 225—250 µm, and their diameter is stable, about 25 µm. Accessory glands are sack-shaped and about 225 µm long and 20 µm wide. Their terminal parts enter the reduced ejaculatory duct independently and centrally compared to the outlets of vasa deferentia.

Sipha (Rungsia) maydis Passerini, 1860 (Fig. 21)

Testes of males of *S. (R.) maydis*, like those of all examined species of the tribe Siphini consist of 3 follicles. They are strongly elongated 63—456 μm long and about 35—40 μm wide and all of them are shifted towards the thorax. Vasa deferentia are 250—300 μm long, their diameter is usually stable along their length (15—20 μm), sometimes are slightly expanded to 30 μm in medial part. Accessory glands are elongated (250—275 μm) and sack-shaped. They enter the shortened ejaculatory duct centrally in relation to the outlets of vasa deferentia.

The observations of the male reproductive system of *S. (R.) maydis* (Fig. 22a—g) in light and transmission electron microscopy show that the testicular follicle wall is built of a layer of elongated epithelial cells standing on thin basal lamina. Within testicular follicle several cysts develop (Fig. 22a). Separate cyst are in different stages of development, i.e. some of them may contain late spermatids, whereas the others contain young spermatids but mainly maturation spermatozoa (Fig. 22b). Moreover, vasa deferentia, accessory glands and ejaculatory duct are histologically very simple. The wall of vasa deferentia is composed of thin layer of circular muscle cells and cubical epithelium of secretory type. The lumen is filled with spermatozoa (Fig. 22c, d). The accessory gland wall has very similar structure as that of vas deferens, i.e. it is composed of circular muscle cells and cubical epithelium of secretory type. The cytoplasm of epithelial cells is rich in rough ER and mitochondria. The apical plasma membrane forms short microvilli. The lumen is filled with material of different density (Fig. 22e, f). The ejaculatory duct is relatively wide and is composed of epithelial cells and a thin layer of cuticle (Fig. 22g).

In males of the so far studied species of the tribe Siphini the following common characteristics of the reproductive system have been observed:

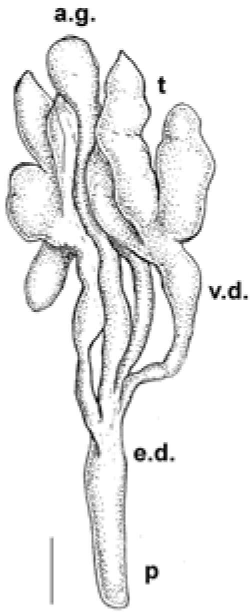
1. The structures of the male reproductive system run parallel to the long body axis; the follicles are usually placed on proximal part of the abdomen (between abdominal segments I—III/IV), whereas the accessory glands are placed on its middle part (between abdominal segments III—IV) (Fig. 23a). The follicles are placed on dorsal part of the abdomen, whereas the accessory glands are placed on its ventral part (Fig. 23b).
2. Testes in all the examined species have 3 follicles of different shape and size, usually arranged in a rosette and strongly elongated.
3. Vasa efferentia in all the examined species are short and connect follicles with vasa deferentia in their apical part.
4. Vasa deferentia run separately, their diameter is usually stable; they can be slightly expanded in 2/3 of their length or only in the proximal part.
5. Accessory glands are usually sack-shaped or club-shaped, elongated, sometimes asymmetric (*Ch. stipae*); only in *A. serrulatus* the accessory glands are strongly elongated and their length equals the length of the entire

reproductive system. The histological structure of the wall of accessory glands (thickness, height and stainability of cells) suggests an excretory function along their length (Fig. 23c).

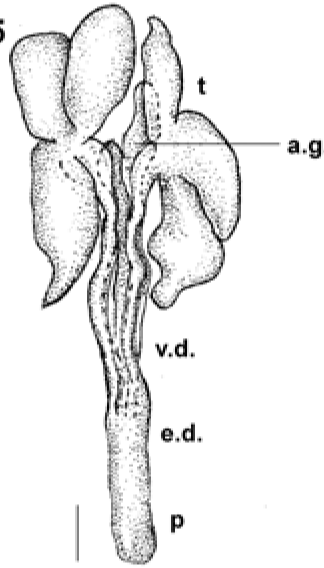
6. Accessory glands and vasa deferentia in the abdomen and inside the penis run separately, opening to the reduced ejaculatory duct (Fig. 23d).
7. The mating behaviour (many short copulations) requires a certain simplicity (both morphological and histological) in the structures of the reproductive system.

Generally, in the species of Chaitophorinae studied so far, the structure of the male reproductive system is homogeneous. In most of the Siphini (genera *Chaetosiphella*, *Laingia* and *Sipha*) the structures of reproductive system are similar to those of the majority of species of the genus *Chaitophorus*, whereas in *A. serrulatus* the structure of the reproductive system resembles that observed in the genus *Periphyllus*.

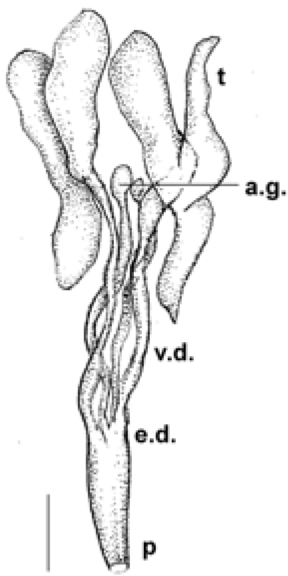
14



15



16



17

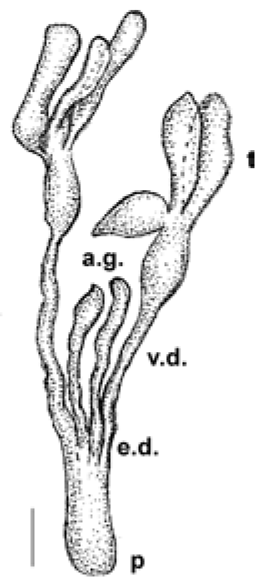
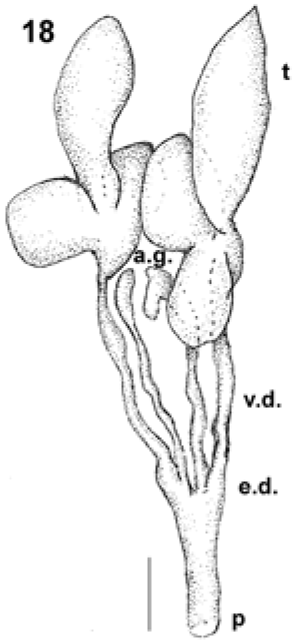


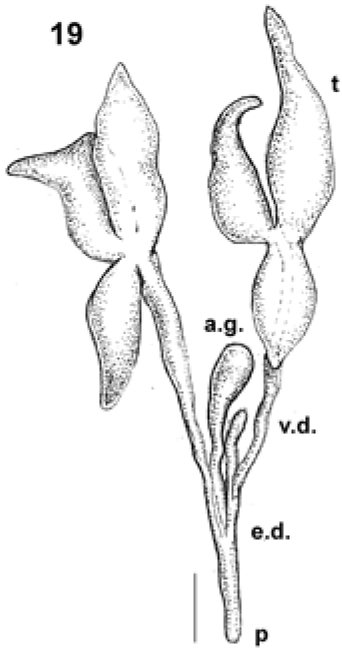
Fig. 14. *Atheroides serrulatus* — the male reproductive system:
t — testis, **v.d.** — vas deferens, **a.g.** — accessory glands, **e.d.** — ejaculatory duct, **p** — penis

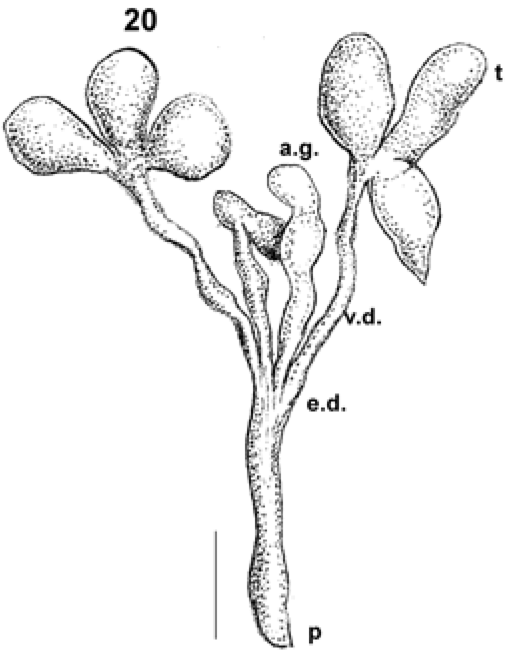
Fig. 15. *Chaetosiphella stipae* — the male reproductive system

Fig. 16. *Ch. stipae* subsp. *setosa* — the male reproductive system

Fig. 17. *Laingia psammae* — the male reproductive system







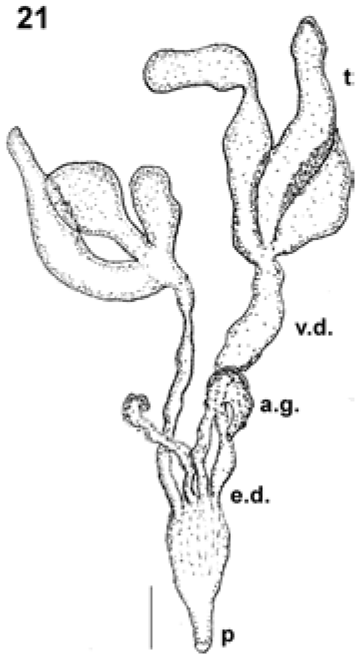


Fig. 18. *Sipha (Sipha) glyceriae* — the male reproductive system
Fig. 19. *Sipha (Rungsia) arenarii* — the male reproductive system
Fig. 20. *S. (R.) elegans* — the male reproductive system
Fig. 21. *S. (R.) maydis* — the male reproductive system

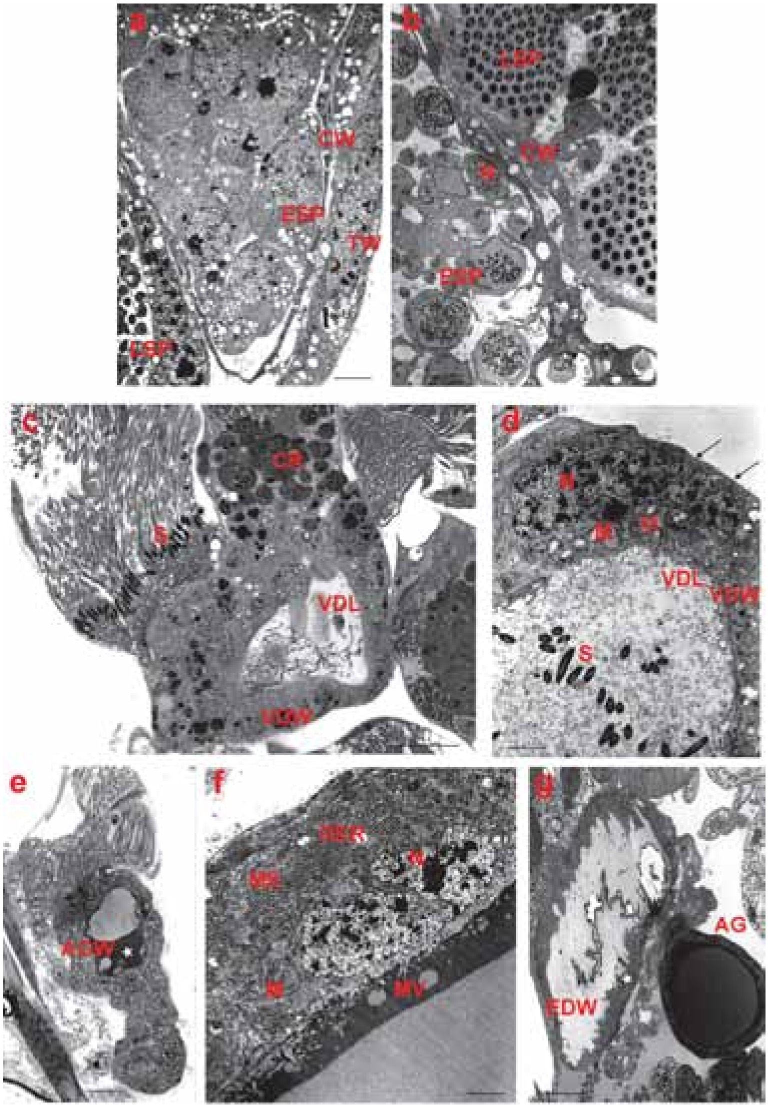


Fig. 22. *S. (R.) maydis* — the male reproductive system:
a — within testicular follicles the cysts with different stages of spermiogenesis are observed: **ESP** — early spermatids, **LSP** — late spermatids, **CW** — cyst wall, **TW** — testicular follicle wall. Transmission electron microscopy (TEM) Scale bar. 2.5 μm; **b** — testicular follicles: in the nuclei (**N**) of early spermatids the chromatin condensation has just begun (TEM). Scale bar. 1.8 μm; **c** — vas deferens and testicular follicles: **VDW** — vas deferens wall, **VDL** — vas deferens lumen filled with spermatozoa (**S**), visible also cell remnants (**CR**). Light microscopy (LM), Methylene blue stained epon section, Scale bar. 20 μm; **d** — vas deferens: the wall is composed of thin layer of circular muscle cells and cubical epithelium of secretory type (arrows), in epithelial cells nuclei (**N**) and mitochondria (**M**) are observed, the lumen is filled with spermatozoa (**S**) (TEM) Scale bar. 2.0 μm; **e** — accessory gland: **AGW** — accessory gland wall, stars point to dense secretion (LM), Methylene blue stained epon section, Scale bar. 15 μm; **f** — accessory gland: the wall is composed of circular muscle (**MS**) and cubical epithelium. In epithelial cells nucleus (**N**), pararel rows of rough ER (**RER**) and mitochondria (**M**) are observed. The apical part of epithelial cells forms microvilli (**MV**) (TEM). Scale bar. 1.4 μm; **g** — accessory gland and ejaculatory duct: **AG** — accessory gland, **EDW** — ejaculatory duct wall, arrows mark cuticle (LM), Methylene blue stained epon section, Scale bar. 30 μm

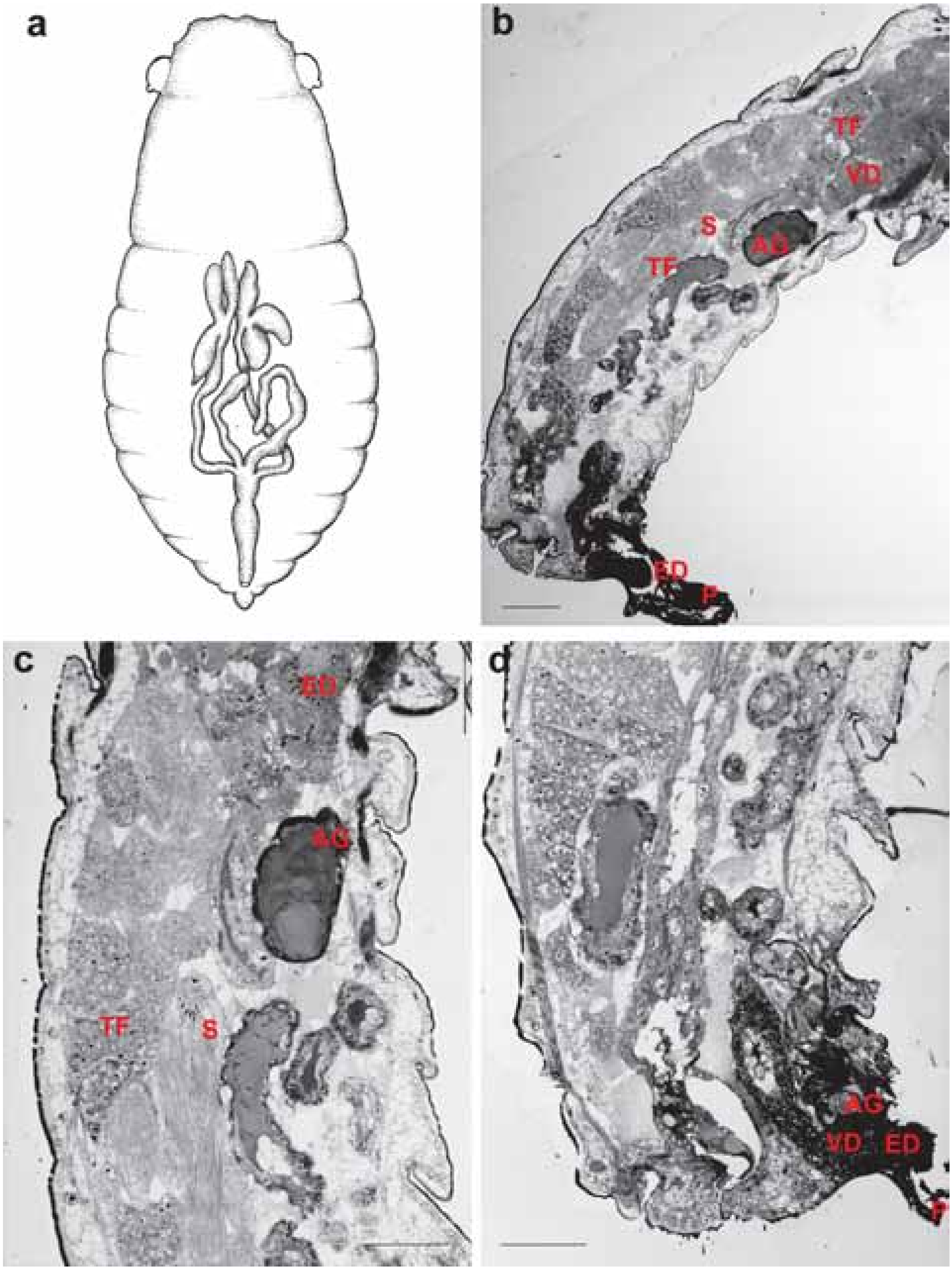


Fig. 23. *Ch. stipae*:
a — the male reproductive system; **b** — thorax and abdomen in longitudinal section: **TF** — testicular follicle with spermatozoa (S), **VD** — vas deferens, **AG** — accessory gland, **ED** — ejaculatory duct, **P** — penis (LM); **c** — thorax and proximal part of abdomen in longitudinal section: **TF** — testicular follicle, **VD** — vas deferens, **AG** — accessory gland (LM); **d** — distal part of abdomen in longitudinal section: **VD** — vas deferens, **AG** — accessory gland, **ED** — ejaculatory duct, **P** — penis (LM), Methylene blue stained epon section, Scale bar. 70 µm

Bionomy

Aphids belonging to the subfamily Chaitophorinae are known to be monoecious and holocyclic. This subfamily is divided into two tribes which represent two bionomical groups. The Chaitophorini are connected with deciduous trees: the genus *Chaitophorus* with Salicaceae; the genus *Periphyllus* with Aceraceae, and only exceptionally with *Aesculus* L. or *Koelreuteria* Laxm.; the genera *Trichaitophorus* and *Yamatochaitophorus* also with the Aceraceae (BLACKMAN, EASTOP 1994). The Siphini, on the other hand, are connected with monocotyledonous plants belonging to the families: Poaceae, Cyperaceae, Juncaceae or Typhaceae.

In comparison with the Chaitophorini, bionomical data of some representatives of Siphini is incomplete or still unknown. This poor knowledge is a consequence of their specific, cryptic habits (the aphids live in small colonies or singly) resulting in the fact that their collection is difficult and thus mostly insufficient. The least is known about the sexuales, because this generation appears only for a short period of time, solely during autumn. Similarly, wing forms are also rather rare. To compare with others species of Chaitophorinae, in the Siphini we can observe the supremacy of viviparous apterous forms. The alatae are usually observed from the second half of June to the first weeks of July, in some species also in August (*S. (R.) arenarii*) and September (*S. (R.) maydis* pers. observ.). The fundatrices of almost all of the Siphini are still unknown.

The Siphini, as most aphid species, hibernate as eggs which are laid soon after the copulation of sexuales (usually in the middle of October). In *S. (S.) flava* the eggs are elliptical-oval, pale green when first laid and black after that. They are usually laid on the underside of the leaf of the host plant, rarely on its stem (DAVIS 1909). The colours of eggs laid by oviparous females of *A. hirtellus* and *S. (S.) glyceriae* were similar, but the eggs were observed on the uppersides of leaves, and in the middle parts of the leaves respectively (JACKSON 1922).

Important studies on the biology of some species belonging to the tribe Siphini were conducted by: LAING (1920) — for *A. serrulatus*, JACKSON (1922)

— for *A. hirtellus*, *A. serrulatus* and *S. (S.) glyceriae*, THEOBALD (1929) — for *A. hirtellus*, *A. serrulatus* and *L. psammae*, and HILLE RIS LAMBERS (1939) — for *C. paniculatae* and *Ch. berlesei*. Bionomical studies of the species which are serious pests of cultivated grasses have also been conducted mainly for *S. (S.) flava* by DAVIS (1909); KINDLER, DALRYMPLE (1999); HENTZ, NUESSLY (2004); OLIVEIRA et al. (2009) and for *S. (S.) glyceriae* (OLMI, VILLANI 1975).

Within the Siphini some species can live on the ground level (*L. psammae*, *S. (R.) maydis* Fig. 24a), but they never feed on the underground parts of their host plants.

The most species live on the uppersides of leaves: in very numerous colonies (*C. paniculatae*, *S. (R.) arenarii* Fig. 24b), in less numerous colonies (*Ch. berlesei*, *Ch. massagetica*, *S. (S.) agropyronensis*, *S. (R.) burakowskii*, *S. (R.) praecocis*, *S. (R.) maydis* Fig. 24c), sitting in rows (*A. brevicornis*) or singly (*A. serrulatus* Fig. 24d). Moreover, most species prefer grasses with visible ridges on the upper surface. In the arid, windy habitats (e.g. in the dune areas) where the leaves are rolling up, this place of feeding protects aphids against dislodging and desiccation (DIXON, SHEARER 1974).

The species which live on the underside of leaves are *A. doncasteri* and *S. (R.) taurica*, whereas *A. hirtellus* live in small colonies between the ribs of the leaf. On both sides of leaves (either on the undersides or uppersides) there can leave *A. karakumi*, *Ch. tshernavini*, *S. (S.) littoralis*.

The second group includes the species which live on steams and uppersides of leaves (*Ch. stipae*) or on the undersides of leaves and inflorescences (*S. (S.) glyceriae*).

Some species change their place of feeding depending on the season and condition of the host plant. For example, in spring dense colonies of apterous viviparous females of *L. psammae* live on the uppersides of leaves (Fig. 25a) steams (Fig. 25b), or inflorescences. In the middle of summer the colonies on steams and the uppersides of leaves are less numerous; the individuals usually live on spikelets (Fig. 25c) or on the lower part of the stem, at the ground level (Fig. 25d). In autumn only few individuals are observed hidden in leaf sheaths in the lower part of the culm (pers. observ.). Similarly, *S. (R.) maydis* can feed on different parts of their host plants: on the lower parts of the stem (almost on the ground level), on the uppersides of leaf blades, near the lingule, and sometimes on inflorescences (pers. observ.). Moreover, the presence of feeding colonies results in the appearance of necrotic areas on plant leaves or causes them to roll upwards. *A. serrulatus* (Fig. 24d) and *Ch. tshernavini* feeding on *Festuca ovina* also results in the ends of blades turning yellow and dry (MÜLLER 1969).

The most complete data has been gathered about the bionomy of *S. (S.) flava* which is a serious pest of cultivated crops such as corn, rice, sorghum or sugarcane, as well as lawn and pasture grasses and occasionally also sedges. This species is monoecious and holocyclic with apterous males in the areas with cold winters, and anholocyclic wherever winter temperatures permit. It occurs in large colonies on the undersides of leaves, lining up along the parallel leaf veins. According to a detailed observation conducted by Davis (1909), young forms hatched from eggs in the middle of March, first alatae morphs were observed at the end of May, whereas oviparous generation from the end of August to the end of November, however some individuals were observed in December or even in January. Males and oviparous females started to copulate in the middle of October and eggs were laid as long as an oviparous female lived (the average number of eggs was 8 per female); the temperature was the controlling factor. The viviparous females produce 1 to 5 nymphs per day for about 22 days; nymphs go through four instars before molting into the adult stage. The development from a nymph to an adult depends on the temperature and the host plant, e.g. on *Sorghum bicolor* it takes about 8 days whereas on *Saccharum* sp. — 18—22 days (Nuessly 2008). The temperatures of 20°C and 24°C are the most convenient for the development and reproduction of this species (Oliveira et al. 2009).

The Siphini are usually not very mobile, with the exception of *C. paniculatae* and *Ch. berlesei*, which drop off the plant when disturbed (Hille Ris Lambers 1939). Furthermore, males are much more mobile than females — they are usually running about upon their host plants (pers. obser.)

Contrary to the Chaitophorini, most species of the Siphini are not visited by ants. In the genus *Atheroides* those attended by ants include *A. karakumi* (in Kazakhstan by *Formica rufa* L. Juchnevitsh 1968), *A. hirtellus* and *A. serrulatus* (pers. observ.), whereas in the genus *Chaetosiphella* the species visited by ants are *Ch. stipae* (in Kazakhstan by *Camponotus herculeanus* L. and *Formica gagates* Latr. Juchnevitsh 1968). In the genus *Sipha* the species visited by ants are: *S. (S.) agropyronensis* (in United States, Gillette 1911), *S. (R.) arenarii* (pers. observ) and *S. (R.) maydis* (in Great Britain by *Lasius niger* (L.), Eastop 1965). *S. (R.) elegans* can be attended by ants when it lives in mixed colonies with *S. (R.) maydis* (pers. observ.). *L. psammae* (pers. observ.) and *C. paniculatae* (Rupais 1989) are also among the species sometimes visited by ants.

The life cycle of some species of the Siphini is still unknown (*A. persianus*, *Ch. longirostris*, *Ch. stipae* subsp. *setosa*). They were collected by sweeping or beating a tuft of their host plants, which is the most common method for collecting grass-feeding aphids.

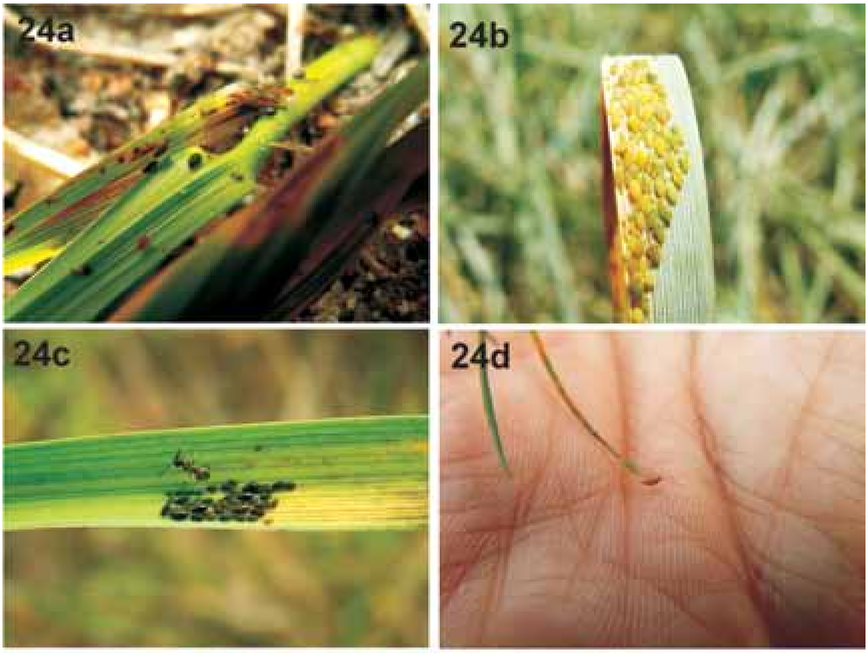


Fig. 24. Bionomy of the Siphini:
a — *S. (R.) maydis* living on the ground level; **b** — dense colony of *S. (R.) arenarii* living on the upperside of a leave; **c** — colony of *S. (R.) maydis* attended by an ant; **d** — single individual of *A. serrulatus* feeding on a leave

Fig. 25. Bionomy of the Siphini:
a — dense colony of *L. psammae* living on the upperside of a leave; **b** — single individuals of *L. psammae* feeding on a stem and **c** — on spicelets or **d** — on a lower part of the stem

Siphini species of economical importance

According to *Aphids as crop pests*, the species that become pests are those that have the most extensive capability for the exploitation of man-modified environments (BLACKMAN, EASTOP 2007). Among aphids about 450 species have been recorded from crop plants, but only about 100 are of significant economic importance, mainly those in the subfamily Aphidinae (BLACKMAN, EASTOP 2000). However, within the Siphini we can also find some species of economic importance which feed on cultivated crops, including cereals, as well as on pasture grasses. These species are serious pests in various parts of the world where they cause severe damage, sometimes as virus vectors.

Among the Siphini, almost exclusively the representatives of the genus *Sipha* were the ones recorded from cereals: *Triticum* (wheat), *Secale* (rye), *Hordeum* (barley), *Avena sativa* (oats), *Zea mays* (maize, corn), *Oryza sativa* (rice) and *Sorghum* (sorghum). *S. (R.) maydis* and *S. (S.) flava* infested all of the mentioned cereals. In addition, these two species are pests of the important cultivated grass *Saccharum officinarum* (sugarcane). *S. (R.) elegans* can be damaging to wheat, rye and barley, whereas *S. (S.) glyceriae* can be damaging to wheat, barley, rice and corn. *S. (R.) uvarovi* and *L. psammae* have been recorded only from *T. aestivum*.

Among the Siphini, the most serious pest, especially in the tropical regions, and a vector of sugarcane mosaic potyvirus is *S. (S.) flava* (BLACKMAN, EASTOP 2000). *S. officinarum* (Puerto Rico: SMITH et. al. 1963; Cuba: ALONSO 1968; Bermuda: STOETZEL, HILBURN 1990; United States,Texas: MEAGHER et al. 1993; Brasil: SOUSA-SILVA, ILHARCO 1995; Marocco: ABDELMAJID 2008), *Sorghum bicolor* (United States,Texas: MEAGHER et al. 1993; United States, Florida: HENTZ, NUESSLY 2004) and *S. halepense* (Brasil: SOUSA-SILVA, ILHARCO 1995; Argentina: NIETO NAFRIA et al. 1992; Chile: GONZALES et al. 1998; Peru: DELFINO 2005) are its hosts of economic importance. However, this species can also feed on over 60 species of grasses, including important species of pasture grasses. *S. (S.) flava* lives on the uppersides of leaves, at the bottom part of the plant, usually in dense colonies. The feeding activity of such colonies causes visible changes in the host plants. These changes depend on the host plant, the season (photoperiodic conditions of spring or autumn) and temperature. Prolonged periods of the species feeding on the sugarcane can lead to the yellowing and reddening of leaves and, in consequence, the death of the plant (Nuessly 2008). On the infested leaves of *S. halepense* there usually appears a reddish discoloration (Costa Arbulu et al. 2001), which has been identified as an anthocyanin; the changes in chloroplast structure of the infested leaves have also been observed (Gonzales et al. 2002a). The chlorotic symptoms on the leaves of *S. halepense* appeared both in spring and autumn seasons (Gonzales et al. 2002b). According to the greenhouse studies (Starks, Mirkes 1979), *S. (S.) flava* preferred wheat and barley to other cereals, whereas corn and oats were among the least settled.

Although *S. (R.) maydis* can feed on about 100 species of wild grasses, in some regions of the world it is causing serious damage feeding on cereal crops. It feeds on stems, leaves and ears, and often appears in big colonies (Petrovic 1996). In the Mediterranean region this aphid species was mostly recorded from wheat (France: Leclant 1967; Italy: Passerini 1860; Bosna and Hercegovina: Petrovic 1996; Israel, Turkey: Bodenheimer, Swirski 1957; Marocco: Mimeur 1933) and corn (Spain: Nieto Nafria, Mier Durante 1998; Italy: Martelli 1950; Lebanon, Turkey: Bodenheimer, Swirski 1957). In the north-west part of Europe *S. (R.) maydis* prefers wild grasses than cereals and is of little importance as a pest; for example in Great Britain (Stroyan 1977) or the Scandinanavian countries (Heie 1982) it has not been recorded from cereals. On the other hand, from the Ukraine (Mamontova 1949), and localities in Central Asia (Tajikistan: Narzikulov 1962) and Pakistan (Mahmood et al. 2002) there have been reports of a serious damage caused by this species, mostly on wheat and barley. Heavily infested plants react with yellowing leaves and deformated spicelets. Similarly, *S. (R.) maydis* was recorded from South Africa (Millar 1990) and Argentina (Corrales et al. 2007) feeding on cultivated wheat, barley and *S. halepense*. In Argentina this species has colonized a wide range of regions in various climatic conditions and for this reason its control is now difficult. In addition, wild grasses are a natural host plant reservoir for this species. *S. (R.) maydis* can transmit cucumber mosaic *cucumovirus* and barley yellow dwarf *luteovirus* (Blackman, Eastop 2000).

In comparison with the two above mentioned species *S. (S.) glyceriae*, *S. (R.) elegans* and *S. (R.) uvarovi* feeding on cultivated crops are evidently of little importance as pests, however *S. (R.) elegans* is a vector of barley yellow dwarf *luteovirus* (Blackman, Eastop 2000). *S. (S.) glyceriae* can be injurious on rice (Italy: Olmi, Villani 1975; Yano et al. 1983; France: Leclant 1967; Portugal: Ilharco 1991—1995) causing transverse linear necrotic areas on the leaves. This species was also recorded from corn (Italy: Martelli 1950) and wheat (Italy: Roberti 1990—1991). *S. (R.) elegans* occurs on some cereal crops such as wheat or barley (Russia: Mordvilko 1929; Ukraine: Mamontova-Solukha 1963, Canada: Robinson, Bradley 1968; Italy: Roberti 1990—1991; China: Tao 1999) sometimes in small numbers in mixed colonies with *S. (R.) maydis* (Pakistan: Mahmood et al. 2002). It feeds on the lower parts of stems and at the bases of leaves (Petrovic 1996).

The Siphini are also pests of numerous pasture grasses. In Eurasia, representatives of all genera of the Siphini feed on *Alopecurus pratensis*, *Arrhenatherum elatius*, *Bromus inermis*, *Dactylis glomerata*, *Digitaria ciliaris*, *Festuca pratensis*, *F. rubra*, *Lolium multiflorum*, *L. perenne*, *Phalaris arundinacea*, *Phleum pretense*, *Poa pratensis*, *P. trivialis*, *Trisetum flavescens*. The most preferred species are *F. rubra*, and *D. glomerata*. In the places where they are feeding, the aphids are causing serious damage (necrotic patches); the grass is turning brown. In North America the best hosts for *S. (S.) flava* among the warm-season grasses are *Echinochloa frumentacea*, *Pennisetum orientale*, whereas among the cool-season the pasture grasses the best hosts are *Bromus mollis*, *B. biebersteini* and *B. marginatus*. In the Hawaiian Islands the species has been recorded mainly from *Pennisetum cladestinum*. Prolonged periods of its feeding lead to the occurrence of distinct circular chlorotic spots, as well as drying and turning brown of the leaf tips. Under natural conditions, pasture grasses are better hosts than cereal crops such as barley, oats, rye and wheat (Kindler, Dalrymple 1999).

Understanding the life cycle of pest species is essential to the development of an integrated pest management (IPM) strategy (Hentz, Nuessly 2004). Biological control is a component of this strategy and is defined as the reduction of pest populations by natural enemies. Natural enemies of pest aphids belonging to the tribe Siphini include predators and parasitoids. *Syrphus balteatus* (De Geer) (predator) and an aphidiid wasp *Lysiphlebus ambiguus* (Hal.) (parasitoid) were recorded on *S. (R.) maydis* in Pakistan (Mahmood et al. 2002). This parasitoid was also introduced in Hawaii for the purpose of gaining control over *S. (S.) flava* (Culliney et al. 2003), whereas the major natural parasitoid for this species in Argentina was *L. testaceipes* (Cresson) (Gonzales et al. 2002b). The population of *S. (S.) flava* is also reduced by predators: *Doru terminatum*, 10 species of Coccinellidae (e.g. *Diomus terminatus* Say), predacious ants (e.g. *Solenopsis invicata* Buren) and young spiders (Nuessly 2008). *Hippodamia tredecimpunctata* (L.), *Anisosticta novemdecipunctata* (L.) (Coccinellidae) and *Orius majusculus* (Reuter) (Anthocoridae) were reported as predators of *S. (S.) glyceriae* (Italy: Yano et al. 1983).

Autecology

An ecological analysis encompasses the preferences of particular aphid species of the Siphini tribe with reference to:

1. Trophic preferences: **M1** — 1st degree monophagous associated with only 1 host plant species, **M2** — 2nd degree monophagous associated with only 1 host plant genus, **O1** — 1st degree oligophagous associated with host plant species belonging to 1 plant family, **O2** — 2nd degree oligophagous associated with host plant species belonging to 2—4 plant families (according to the criteria proposed by NICKEL, REMANE 2002)
2. Habitat preferences: **Hygrophilous** — species preferring damp and boggy habitats, **Mesophilous** — species encountered in the habitats with diversified humidity levels, **Xerophilous** — species associated with dry biotopes exposed to strong sunshine (according to the criteria proposed by CZECHOWSKI, MIKOŁAJCZYK 1981), **Halophilous** — species living in a salty habitats. The dependence on humidity and salinity was determined on the basis of ecological indicators preferred by host plants (FALKOWSKI 1982; ZARZYCKI et al. 2002) and the frequency of occurrence of particular species of the Siphini on particular species of host plants (on the basis of the literature cited and the analysed material from museal collections — unpublished data).

Host plants and trophic specialisation range

Aphids belonging to the tribe Siphini are trophically associated almost exclusively with monocotyledonous plants of such families as Poaceae, Cyperaceae, Juncaceae and Typhaceae. In total, they are associated with 97 genera and 271 species of host plants that belong to the above mentioned families. Only in extraordinary cases the aphids in question were observed feeding on the Alismataceae (*Sagittaria sagittifolia* L. — *S. (S.) glyceriae*), Caryophyllaceae (*Stellaria media* (L.) Vill. — *S. (R.) maydis*), Rutaceae (*Ptelea trifoliata* L. — *S. (R.) maydis*) or Plumbaginaceae (*Acantholimon pamiricum* Czerniak. — *Ch. stipae*).

Among host plants of the Siphini the most numerous group is that of grasses (Poaceae), with the number of genera estimated at 600—800, and the number of species estimated at 8—10000. The richest genera with respect to species are: *Poa* L. (about 500 species), *Festuca* L. (360—450 species) and *Calamagrostis* Adans. (230—270 species) (Frey 2002). Among the 25 aphid taxa of the tribe of Siphini only 3 do not feed on grasses (*A. persianus*, *C. paniculatae*, *S. (R.) praecocis*), while the remaining species have been encountered on 90 genera and 219 species of these plants. The genera of *Bromus* L., *Aegilops* L., *Festuca*, *Stipa* L. and *Poa* include the largest number of species on which the Siphini feed (12, 11, 10, 10, 9 species respectively). Among these, the most favoured genus is *Festuca*, with which there are associated 3 genera and 11 species of aphids that belong to the tribe of Siphini. It is also worth noting that other representatives of the tribe, which are not associated trophically with the genus of *Festuca*, are mainly 1st or 2nd degree monophagous, mostly feeding on *Deschampsia* P. Beauv. or *Ammophila* Host (*A. doncasteri*, *A. hirtellus*, *Ch. longirostris*). Among the Poaceae, the most favoured host plant group also includes the representatives of such genera as *Alopecurus* L., *Ammophila*, *Deschampsia*, *Elymus* L. and *Poa*, with which there are associated 8 taxa of the Siphini, while 40 species of grasses are associated only with one, usually a widely oligophagous species of the Siphini (e.g. *Aira caryophyllea* with *Ch. berlesei*, *Arundo donax*, *Briza minor* with *S. (R.) maydis*, *Catabrosa aquatica* with *S. (S.) glyceriae*, *Miscanthus sinensis* with *S. (S.) flava)*.

With reference to the number of species, the sedges (Cyperaceae) are the second most numerous group of host plants of the Siphini. Depending on the systematic approach applied, they include about 100—200 genera and 4000—4350 species (Świdzińska 1998). The Siphini have been recorded on 5 genera, 37 species and 1 subspecies of the sedges. With the Cyperaceae there are associated 10 aphid species of the tribe of Siphini. The monotypic genus *Caricosipha*, as well as *A. persianus*, and *S. (R.) praecocis*, are associated exclusively with sedges, while the representatives of the genus *Chaetosiphella* never feed on sedges. Among the Cyperaceae the most numerous group of host plants comprises 34 species belonging to the genus *Carex* L. 9 species of the Siphini have been recorded on them, while on the remaining genera: *Cyperus* L., *Eleocharis* R. Br., *Schoenoplectus* (Rchb.) Palla and *Schoenus* L. there feeds only *S. (S.) glyceriae*.

With the Juncaceae, comprising 7 genera and about 400 species (Świdzińska 1998), 7 species of the Siphini are associated. They feed exclusively on the species belonging to the genera *Juncus* L. and *Luzula* D.C. The most preferred host plant genus is *Juncus*, as there are 7 species of the Siphini associated with 7 plant species of the genus in question. Representatives of the genus *Chaetosiphella* do not feed on the Juncaceae.

The Typhaceae, represented by 1 genera and about 30 species (Świdzińska 1998), constitute a marginal group of host plants for the Siphini. Only on *Typha* *latifolia* there has been recorded 1 aphid species belonging to the tribe in question, namely *S. (S.) glyceriae*.

Among aphids that belong to the tribe of Siphini, the largest group (13 species and 1 subspecies) constitute the taxa associated exclusively with grasses. These are, among other, all species belonging to the genus *Chaetosiphella* and a majority of species belonging to the genus *Sipha*. *A. persianus* and *S. (R.) praecocis* feed exclusively on sedges, while *C. paniculatae* feeds on the Cyperacea and Juncaceae. 2 species, *L. psammae* and *S. (S.) flava*, feed on grasses and sedges, while *A. hirtellus* feeds on the Poaceae and Juncaceae. 4 species belonging to the tribe Siphini may feed on the Poaceae, Cyperaceae and Juncaceae. With the exception of *A. brevicornis* they are widely distributed and associated with the largest number of host plant species among the Siphini. Only 1 species, i.e. *S. (S.) glyceriae*, is associated with the Poaceae, Cyperaceae, Juncaceae and Typhaceae, and probably, similarly to the above mentioned ones, it is a widely distributed species associated with a large number of host plant species (Table 2).

The Siphini, similarly to most aphids, are very host specific. *Ch. longirostris*, *S. (R.) praecocis* and *S. (R.) taurica* are 1st degree monophagous (M1) associated with only 1 host plant species, while *A. doncasteri* and *Ch. massagetica* are 2nd degree monophagous (M2), feeding on 1 genus of host plants. Most of the Siphini are 1st degree oligophagous (O1) associated with host plants that belong to one family (mainly Poaceae — 10 species, e.g. *A. karakumi*, most species of the genus *Chaetosiphella*), or 2nd degree oligophagous (O2) associated with host plants that belong to 2—4 families (10 species, e.g. *C. paniculatae*, *L. psammae*, *S. (S.) flava*, *S. (R.) maydis*). The genus *Atheroides* is characterized by the largest number of species which are 2nd degree oligophagous, while the genus *Chaetosiphella* and the subgenus *Rungsia* comprise the largest number of species which are 1st degree oligophagous. Each of these genera that belong to the tribe of Siphini, except for *Chaetosiphella*, is represented by at least 1 species associated with a great number of host plants belonging to various families (*Atheroides* — *A. serrulatus* feeds on 45 host plants species, *Sipha* — *S. (R.) maydis* feeds on 112 host plants species, *S. (R.) elegans* feeds on 62 host plants species, *S. (S.) glyceriae* feeds on 67 host plants species, *S. (S.) flava* feeds on 66 host plants species, *Caricosipha* feeds on 26 host plants species, *Laingia* feeds on 25 host plants species).

The high host specificity is also manifested by the fact that some species belonging to the tribe of Siphini, classified as 1st or 2nd degree oligophagous are characterized by a high level of preference with respect to specific host plant species. However, in surrogate habitats they may feed facultatively on other plant species. For instance, the halophilous species *A. brevicornis* (O2), which is most often associated with salt marshes, usually feeds on *Puccinellia distans* or *P. maritima*, while in the inland localities it is associated mainly with the genus *Festuca* (*F. ovina*, *F. rubra*, *F. thalossica*), and less frequently with the Cyperaceae (*Carex distans*) or the Juncaceae (*Juncus compressus*, *Luzula* sp.). Similarly, for *S. (R.) arenarii* (O1) the major host plant is *Leymus arenarius* (growing on inland and coastal dunes), however, in other habitats the species in question was also recorded on *Avena ludoviciana* (NARZIKULOV 1962) and *Elymus hispidus* (VERESCAGIN et al. 1985). Among the aphid species which are associated with a very large number of host plants belonging to various families there can also be observed some preferences with respect to particular species or genera of host plants. *A. serrulatus*, which feeds on the Poaceae, Cyperaceae and Juncaceae, is most frequently encountered on grasses with narrow, awl-shaped leaves (*Festuca* sp., *Nardus* sp., *Corynephorus canescens*), while *S. (R.) elegans* prefers *Elymus repens* and grasses of the genus *Aegilops* to any other among its numerous host plants. Similarly, *S. (S.) glyceriae* may feed on plants belonging to the families Poaceae, Cyperaceae, Juncaceae and Typhaceae, but its major host plants are the representatives of the genus *Glyceria*.

Species belonging to the tribe Siphini are mostly oligophagous; the species associated with the largest number of host plant species and genera is *S. (R.) maydis* (58 genera and 112 species of host plants).

Habitat preferences

Among aphids belonging to the tribe Siphini, the hygrophilous species, preferring damp and boggy habitats, are the least numerous (4). A radical example is *S. (S.) glyceriae*, a species feeding mainly on plants that grow in the proximity of water or, most frequently, on ones that grow directly in water (*Glyceria* sp., *Juncus* sp., *Typha latifolia*), and is very rarely encountered in drier habitats. Similarly, *C. paniculatae* feeds mainly on the Cyperaceae characteristic of damp habitats and has been recorded only in several individual localities in drier habitats, feeding on *Carex hirta* (RUPAIS 1989) or *C. ligerica* (OSSIANNILSSON 1959). *A. doncasteri* is associated with a similar habitat type and feeds mainly on *Deschampsia caespitosa*, while *A. persianus* probably is a hygrophilous species, too. The species in question was collected with a sweeping net, from the Cypeareace (in Iran, Firuzkuh in the centre of the Alborz mountain range, at the height of 1900 m.a.s.l.), so it is difficult to speculate about specific habitat conditionings with reference to this species.

Among the mesophilous species (9), encountered in habitats that are diversified with respect to humidity levels, there can be counted potentially hygrophilous species, often feeding on plants typically growing in boggy habitats (*A. brevicornis*, *A. hirtellus*, *S. (S.) littoralis)*, but also encountered in warm, dry localities and even on dunes (e.g. *A. hirtellus* feeds on *D. caespitosa* or *Juncus compressus*, but can also feed on *Ammophila arenaria* or *Leymus arenarius*). Furthermore, *A. serrulatus*, *L. psammae* and *S. (S.) flava* are species adapted to a wide plethora of habitat conditions, from very damp ones to dry ones. For example, *L. psammae* feeds on both *D. caespitosa* and *G. fluitans*, but first and foremost on *Calamagrostis epigejos* and *A. arenaria*, while *S. (S.) flava*, the only species within the Siphini distributed also over the tropical zone, feeds mainly on sugarcane, although it is also encountered on many varieties of cereals. Mesophilous species, associated with various habitats but preferring drier localities are *S. (R.) elegans*, *S. (R.) maydis* and *S. (R.) uvarovi*. These species are associated mainly with rather dry meadow communities (*S. (R.) maydis*), and ruderal communities with quackgrass as a dominant species (*S. (R.) elegans*) and most often encountered on road borders, balks, brownfields or railway embankments. They are also frequently encountered in segetal communities (e.g. on *Setaria viridis*), and in cereal crops. The species *S. (R.) elegans* and *S. (R.) uvarovi* most often feed on the common wheat — *Triticum aestivum*, while *S. (R.) maydis* feeds on various cereals: corn, wheat, barley and rye.

A prevailing number of aphid species that belong to the tribe of Siphini are xerophilous species (12), associated with diversified, dry biotopes exposed to strong sunshine (*Ch. berlesei*). The largest group among them constitute the species associated with steppe communities of Eurasia (including Stipa grasslands): *Ch. massagetica*, *Ch. stipae*, *S. (R.) praecocis*, *S. (R.) taurica*, semidesert areas of Central Asia: *A. karakumi*, *S. (R.) burakowskii*, and open areas of North America: *S. (S.) agropyronensis*. Similar habitat conditions have been preserved also in dry mountain valleys (in Europe, in the Alps, *Ch. stipae* feeds on *Stipa capillata* and *S. pennata*, while on rocky and stony grounds *Ch. stipae* subsp. *setosa* is associated with *Achnatherum calamagrostis*). *Ch. longirostris* and *S. (R.) arenarii* are associated with coastal dunes (white dune zone), but the latter species can be also encountered on inland dunes, and even in surrogate habitats, wherever their host plant has appeared (e.g. in excavations remaining after sand exploitation — Poland, Bukowno (pers. observ.); places where artificial planting has taken place, etc.). Among xerophilous species there can be observed a considerable degree of association with sun exposure and a particular type of ground. It is especially true for species characteristic of Stipa grasslands developing on limestone bedrocks, where specific microclimatic conditions are observed, i.e. periodically occurring high temperature of soil and the near-surface layer of air. *Ch. stipae* prefers warm and dry slopes with southern exposure (near the lower Oder River, Owczary — pers. observ.), this being true also under montane conditions (Nieto Nafria, oral information). As for *S. (R.) burakowskii*, it most frequently feeds on *Leymus chinensis*, a grass species adapted to high pH sodic soil (Jin et. al. 2006). Moreover, the above mentioned xerophilous species are exposed to high-amplitude variation in temperature, both on the daily scale and on the annual scale, especially under the conditions of the extremely continental climate of steppes in Central Asia.

Among aphids belonging to the tribe of Siphini there can be differentiated also halophilous species, living in communities with continuous access to salt water and characterized by clearly belt-like conditions. *A. brevicornis* is most frequently encountered in salt marsh communities (mainly with *P. distans* and

P. maritima in the external marsh zone, i.e. up to 30 cm over the average level of heigh water) salty costs of the Atlantic and the North Sea, and only exceptionally also on the salty coasts of the Baltic Sea or the Black Sea. As for *S. (S.) littoralis*, its distribution is limited to the coastal regions of the North Sea, but apart from the marsh zone it can also feed on *Spartina maritima* and *S. townsendii* in the watt zone, i.e. the zone where the salt content in soil is higher, and the ground is periodically covered by water. The above mentioned aphid species may also live in some inland localities, where they are associated with inland salt flats (e.g. *A. brevicornis* in halophilous communities: Hungary,

Table 2. Number species of host plants associated with Siphini, trophic and habitat preferences

Siphini	Poa ceae	Cypera ceae	Junca ceae	Typha ceae	Others Host Plants	Total	Trophic prefe-rences	Habitat prefe-rences
A. brevicornis	8	1	2	—	—	11	O2	M/Hal.
A. doncasteri	2	—	—	—	—	2	M2	H
A. hirtellus	7	—	1	—	—	8	O2	M
A. karakumi	2	—	—	—	—	2	O1	K
A. persianus	—	1	—	—	—	1	O1	H?
A. serrulatus	34	9	2	—	—	45	O2	M
C. paniculatae	—	25	1	—	—	26	O2	H
Ch. berlesei	9	—	—	—	—	9	O1	K
Ch. longirostris	1	—	—	—	—	1	M1	K
Ch. massagetica	2	—	—	—	—	2	M2	K
Ch. stipae	12	—	—	—	1	13	O2	K
Ch. stipae subsp. setosa	3	—	—	—	—	3	O1	K
Ch. tshernavini	5	—	—	—	—	5	O1	K
L. psammae	23	1	—	—	—	24	O2	K
S. (S.) agropyronensis	3	—	—	—	—	3	O1	K
S. (S.) flava	64	2	—	—	—	66	O2	M
S. (S.) glyceriae	48	14	3	1	1	67	O2	H
S. (S.) littoralis	6	—	—	—	—	6	O1	M/Hal.
S. (R.) arenarii	3	—	—	—	—	3	O1	K
S. (R.) burakowskii	2	—	—	—	—	2	O1	K
S. (R.) elegans	60	1	1	—	—	62	O2	M
S. (R.) maydis	105	2	3	—	2	112	O2	M
S. (R.) praecocis	—	1	—	—	—	1	M1	M
S. (R.) taurica	1	—	—	—	—	1	O2	K
S. (R.) uvarovi	4	—	—	—	—	4	O1	M

Trophic preferences: **M1** — 1st degree monophagous, **M2** — 2nd degree monophagous, **O1** — 1st degree oligophagous, **O2** — 2nd degree oligophagous. Habitat preferences: **H** — hygrophilous, **K** — xerophilous, **M** — mezophilous, **Hal**. — halophilous.

Lajosmizse PINTERA 1965) or secondary habitats with considerable levels of salinity. They may also feed on other plant species than the halophilous ones. Furthermore, the expansion and colonisation of new habitats by *P. distans* is a new phenomenon. At present, the plant species in question is recorded also on post-industrial wastelands, but in connection with the application of sodium chloride to fight black ice, it can be encountered along the roads and in parking lots as well (BLONSKA 2007). Thus, it can be expected that the distribution of *A. brevicornis*, associated with this host plant, may become wider, encompassing the above mentioned secondary habitats.

Chorological analysis

The chorological analysis focuses on the spatial aspect of aphid distribution with reference to the tribe of Siphini, and its affinity to particular range elements. As there is no homogeneous typology of range elements in aphidological studies, the typology adopted for the purpose of this monograph complies with the criteria proposed by Mazur (2001). The choice of this particular study was conditioned by the fact that its author had accounted for the diversification of environmental conditions over the analysed area (Palearctics, where a majority of the Siphini are also distributed), and also for the diversification of the flora, especially the xerothermic vegetation (most aphids belonging to the tribe of Siphini are xerophilous species, monophagous or narrow oligophagous, and their distribution is tightly connected with the presence of their host plant and a particular vegetation formation). On the basis of the cited literature and the studied material deposited in museal collections (unpublished data), the range element and dispersion element were established for individual species (modified criteria after Mazur 2001), and in the case of some species also their altitudinal distribution.

The word "element" is used here exclusively in chorological sense.

Range elements

A range is understood as an area encompassing the center of dispersion of a particular species together with its highest frequency of occurrence conditioned by ecological requirements. The localities situated far from the centre of the range are of lesser importance. It is also true for localities which have come to existence due to human activity.

The majority of aphids belonging to the tribe of Siphini are distributed over Palearctics, with only two species being indigenous to Nearctics. In order to determine range elements, the above mentioned zoogeographical regions have been divided into the following areas:

Atlantic area — Portugal, Spain (in the north-west direction along the line between Salamanca and San Sebastian) France (the Mediterranean part excluded), Luxembourg, Belgium, the Netherlands, Denmark, Norway, Great Britain, Ireland, Iceland;

Mediterranean area — northern part of Africa, Israel, Jordan, Syria, Lebanon, Cyprus, Greece, Macedonia, Albania, Croatia, Bosnia and Herzegovina, Serbia, Italy, Switzerland, France (south-east from the line between Toulouse and Lyon), Spain (the extra-Atlantic part);

Pannonian area — Romania, Hungary, Slovakia, Czech Republic, Austria;

Baltic area — Germany, Poland, Belarus, the European part of Russia, Lithuania, Latvia, Estonia, Finland, Sweden, Denmark;

Pontic area (Black Sea area) — Turkey, Armenia, Azerbaijan, Georgia, Russia (south along the line between Kursk and Kazan), the Ukraine, Moldova, Romania (the part situated on the outer side of the Carpathian Curve);

Caspian area — Kazakhstan, Russia (south of Ufa to the Kazakhstan border and Altai Krai, Altai Republic and Tuvan People's Republic), Uzbekistan, Turkmenistan, Afghanistan, Iran, Iraq;

Kyrgyz area — Kyrgyzstan, Tajikistan, China (the north-western part with Dzungarian Basin and Tarim Basin);

Siberian area — Russia (Western, Central and Eastern Siberia with the exclusion of the Siberian coast of the Pacific);

Mongolian area — Mongolia and the adjoining southern part of China;

Pacific area — North Korea, China, Russia (Siberian coast of the Pacific), Japan;

American area — the United States of North America.

The names of range elements are based on the names of differentiated areas, and in the case of two-word names, also on peripheral areas in the ranges of particular species (Mazur 2001, modified). Only these elements are characterized, to which belong the species representing the tribe of Siphini discussed in this monograph.

1. **Palaearctic range element (Pacific-Atlantic)**

   The species which belong to this element are usually widely distributed all over Palearctics. In the east their localities stretch towards the Russian Far Eastern Federal District (Primorsky and Khabarovsky Krai), and in Europe they stretch towards the British Isles in the west, and Sicily and Sardinia in the south.

   A. hirtellus, *A. serrulatus*, *L. psammae*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*.

2. **Mongolian range element**

   The Mongolian range element has been established exclusively for one species recorded in some individual localities in Mongolia.

   S. (R.) burakowskii.

3. **Mongolian-Atlantic range element**

   This element has been established for species distributed over Inner Mongolia (an autonomous region of the People's Republic of China) stretching towards the coasts of the Atlantic Ocean in the west.

   Ch. stipae, *S. (R.) arenarii*.

4. **Kirghisian-Pontian range element**

Marginal localities of the species belonging to this element are situated in Uighur Autonomous Region of the People's Republic of China in the east and reach as far as the Stavropolsky Krai of the Russian Federation in the west.

A. karakumi.

5. **Caspian range element**

The Caspian range element has been established for one species recorded solely in single localities in Kazakhstan.

Ch. massagetica.

6. **Caspian-Atlantic range element**

The acreage of species belonging to this element spreads from submontane areas of the Tuvan's People Republic in the east towards the Atlantic coasts of France and Ireland.

A. doncasteri, *Ch. berlesei*.

7. **Caspian-Baltic range element**

Contrary to the previous element, the range of the species which belongs here is considerably smaller, stretching from steppe areas of the Altai Krai in the east towards the Baltic Sea coast.

Ch. tshernavini.

8. **Caspian-Pontian range element**

The Caspian-Pontian element includes species distributed over steppe areas of the Altai Krai and Central Kazakhstan and stretching towards the Black Sea Basin.

A. persianus, *S. (R.) praecocis*, *S. (R.) taurica*, *S. (R.) uvarovi*.

9. **Ponto-Atlantic range element**

The acreage of species belonging to this element stretches from the Black Sea basin in the east towards the British Isles in the west. In some exceptional cases they may also diffuse into the Mediterranean area.

A. brevicornis, *C. paniculatae*.

10. **Atlantic range element**

This element has been established for a species recorded exclusively in a single locality on the Atlantic coast of Portugal.

Ch. longirostris.

11. **Baltic-Atlantic range element**

The acreage of the species belonging to this element encompasses the Baltic Sea basin and stretches towards France and Ireland.

S. (S.) littoralis.

12. **Mediterranean range element**

This element has been established for a species recorded exclusively in single localities situated in the French region of Provence-Alpes-Côte d'Azur, mainly in the mountainous area in the Hautes Alpes department and individual localities in southern France.

Ch. stipae subsp. *setosa*.

13. Nearctic range element

The species belonging to this element are distributed over the United States and associated with the open grasslands of North America, as well as with secondary habitats, mainly cereal crops.

S. (S.) agropyronensis, *S. (S.) flava*.

Dispersion elements

Natural ranges of aphids belonging to the tribe of Siphini depend on the presence and distribution of their host plants, which usually belong to a specific vegetation formation encountered under specific conditions with respect to ecology, soil, climate, etc. Apart from these conditionings, while establishing dispersion elements the important data to be taken into account include the already existing knowledge about the distribution of particular species, the way the localities are distributed within the acreage and the shape of its borders. In the approach adopted in this study, a dispersion element refers to a group of species which have developed contemporary ranges by migrating from the same area (dispersion centre) and indicates the origin of a species in a geographical context (Mazur 2001).

1. West Palaearctic dispersion element

The ranges of species belonging to this element have a highly latitudinal stretch ratio. Their localities stretch from the Far Eastern regions of the Russian Federation and the Korean Peninsula, through the semidesert, steppe and forest-steppe areas of Central Asia, Turan Depression, Iranian and Anatolian Plateaus, Krym and Podolia towards the European coasts of the Atlantic Ocean and the British Isles in the west, with the number of localities clearly decreasing towards the east. The localities stretching furthest north are in the Baltic Sea area (southern and central parts of the Scandinavian Peninsula), and in the south reach towards Sicily and Sardinia. Usually, the species in question do not diffuse into the Palearctic part of North Africa; only *S. (R.) maydis* is encountered in Algeria and Morocco, *S. (S.) glyceriae* in Tunisia, whereas *A. serrulatus* has been recorded in Madera. A majority of species belonging to the West Palaearctic dispersion element are characterized by the widest spectrum of trophic preferences (2nd degree oligophagous) and ecological preferences, and inhabit diversified habitats, including ruderal and segetal habitats, as well as cereal crops. Taking advantage of habitats created by man the species in question have also spread far beyond their natural range of distribution. *A. serrulatus* has been recorded in Canada, *S. (S.) glyceriae* and *S. (R.) elegans* in Canada and the United States, while the widest distribution range among all species belonging to the tribe of Siphini is that of *S. (R.) maydis*, with localities in the United States, Argentina, South African Republic, India and Pakistan.

2. Ponto-Caspian dispersion element

The acreage of species belonging to this element is associated with steppe formations. In the east they reach towards Jilin (a province in northwestern China), stretching across the steppes of Mongolia, Tuva Basin, steppes of the Western Siberia (mainly the Kulundin Steppe) and the steppes of Kazakhstan (*A. karakumi*, *Ch. massagetica*, *S. (R.) burakowskii*). In the west they stretch from the Volga Upland, through the Black Sea Lowland towards Podolia (*S. (R.) praecocis*, *S. (R.) tauric*a, *S. (R.) uvarovi*), only in exceptional cases diffusing into Central Europe (*Ch. tshernavini*). The only species which has become distributed further in the western direction is *Ch. stipae*, encountered in the steppes of Central Asia (also in the basins or on plateaus e.g. Tarbagatay submountain region, Pamir Mts.), while in the central and western Europe it is encountered in the Pannonian Basin and in isolated localities associated with xerothermic Stipa grasslands. As extraseasonal vegetation, they usually inhabit small stretches of land with specific habitat conditions, i.e. xerothermic habitats which are dry, arid, exposed to strong sunshine, with southern, south-western or south-eastern exposures, and developing on limestone bedrock. This type of habitats is present in Poland (in river valleys — localities in the proximity of the lower Oder River), Czech Republic, Germany, and also in dry inner Alpine valleys, mainly in Hautes-Alpes; they are also encountered in the northern and central parts of Spain.

3. **Central European-Atlantic dispersion element**

The localities of species belonging to this element are mainly situated in northern Europe, Baltic Sea basin and the Atlantic coast of France, Ireland and Great Britain. They encompass such floristic provinces as the Atlantic Region and the upland-lowland region of Central Europe (Kornaś, Medwecka-Kornaś 2002). Further east the number of localities considerably decreases. Single localities have been recorded in Krym (*A. brevicornis*, *C. paniculatae*) as well as the Kulundin steppes and Tuva Basin (*A. doncasteri*, *Ch. berlesei*), where the above-mentioned species may also be encountered in the much damper habitats of the forest-steppe. Three species belonging to the Central European-Atlantic dispersion element are associated with azonal vegetation, which makes their acreage dependent on specific ecological conditions and specific type of ground, while the climate is a less important factor here in comparison with the species belonging to the Ponto-Caspian dispersion element, which remain under the influence of the continental climate. *A. brevicornis* and *S. (S.) littoralis* are associated with salt flat vegetation, while *S. (R.) arenarii* is associated with dune vegetation (coastal and inland dunes). Among all species of this dispersion elements only *C. paniculatae* diffuses into the Mediterranean area, and the extreme borders of its range reach Greece and Sicily.

4. **Central American dispersion element**

This element includes only 1 species, i.e. *S. (S.) flava*. The species might be originally associated with the spacious grassland areas of the Great Plains (the western part of the North American-Atlantic area), which in the prevailing part have been turned into cultivated fields and pastures. This resulted in the appearance of easily accessible new host plants — wheat, millet, corn, sorghum. Taking advantage of man-created environments, the species in question spread northwards reaching British Columbia and Manitoba in Canada, but the number of its localities clearly increases along the south-eastern direction reaching the state of New York in the north and the states situated around the Mexican Bay in the south. Nowadays, the species in question is very widely distributed, and its range encompasses Central America, the Bahamas and the Antilles, as well as South America (to the Buenos Aires Province in Argentina in the south). It is also encountered in faraway archipelagos, such as the Hawaii, the Azores and Madera. In recent years it has also been recorded in Morocco. Thus, it may be concluded that *S. (S.) flava* is an invasive species, a serious pest of cereals, especially sugarcane, which is the major host plants for this species in the tropical climate zone.

5. **Unknown dispersion element**

   Into this group there belong species which have either been discovered comparatively recently, or have been recorded only in few localities, and thus their ranges are not well known as yet. Temporarily they have been classified as belonging to the Ponto-Caspian dispersion element (*A. persianus*), Atlantic dispersion element (*Ch. longirostris*), Mediterranean dispersion element (*Ch. stipae* subsp. *setosa*) and Nearctic dispersion element (*S. (S.) agropyronensis*). If new localities are discovered, it will become possible to verify the affinity of these species to particular elements and specify the dispersion elements where they belong. It is worth noting that the species in this group are mostly 1st degree monophagous or narrow oligophagous with strictly specified trophic preferences, and thus their ranges are naturally restricted to small acreages depending on the distribution of their host plants, and there are no possibilities for them to disperse further, beyond the acreages of local character.

Altitudinal distribution

Detailed data on the vertical distribution of aphids belonging to the tribe of Siphini are fragmentary. The presence of individual species has been recorded in the Alps, Pyrenees, Elburz Mountains, Suphan Dagi and the Andes. Among these species there are no typically montane elements, with the exception of *A. persianus*, which until now has been recorded only at considerably high altitudes above sea level: in Turkey, Konya Province, Karapinar, submountain region of Taurus Mts. and in Iran, Alborz Mts. — the vicinity of Ghazvin 1500 m.a.s.l. as well as Meygoun, Firuzkuh 1900 m.a.s.l. (MNHN Collection). The species of *Ch. stipae* subsp. *setosa* has a seemingly montane character as well, having been recorded mainly in the French Hautes Alpes Department, e.g. Mount la Roche de Raun, 1100 m.a.s.l. (MNHN Collection).

The remaining species are commonly encountered in the lowland areas, and in the mountains they are characterized by a wide vertical range. For example, *A. serrulatus* has been recorded in the French Alps (Haute-Savoie Department, Col des Montets, MNHN Collection) at the altitude of 1460 m.a.s.l., in the French Pyrenees, (Hauites Pyrenees, d'Estibere, MNHN Collection) at the altitude of 2000 m.a.s.l., in Turkey, Suphan Dagi (Bitlis Province, Tatvan, MNHN Collection) at the altitude of 1850 m.a.s.l. In Iran it has been recorded in Ghazvin Province, Alborz Mts. (MNHN Collection) at the following altitudes: 1500 m.a.s.l. (Lashgarak), 1800 m.a.s.l. (Ghaemshahr) and 1900—2000 m.a.s.l. (Meygoun). Similarly, *S. (R.) elegans* is encountered in the Alps (Hautes Alpes Department, Villeneuve la Salle, MNHN Collection) at the altitude of 1400 m.a.s.l.; in the submontane region of Taurus (Turkey, Konya Province, Eregli, submontane region of Taurus Mts., MNHN Collection) at the altitude of 1500 m.a.s.l., while in the Elburz Mts. (Iran, Ghazvin Province, Alborz Mts., Gatch-Sar, Ghaemshahr, MNHN Collection) it has been recorded at the altitude of 2000 m.a.s.l. At high altitudes in the Elburz Mts. there has also been recorded the presence of *L. psammae* (Iran, Ghazvin Province, Alborz Mts., Lashgarak 1650 m.a.s.l., Gatch-Sar, 2000—2200 m.a.s.l., MNHN Collection) and *S. (S.) glyceriae* (La'lezar 2600—2800 m.a.s.l., MNHN Collection). In Europe, *Ch. stipae* is encountered in isolated localities, including, among others, dry valleys at the foothills of the Alps (Switzerland: Valais, Italy: d'Aoste at the altitude of about 600 m.a.s.l. Jörg, Lampel 1988), in Pyrenees (Spain, Puerto de Cofetablo, Pyrenees Mts., UL Collection) at the altitude of about 1400 m.a.s.l., while in the Elburz Mts. (Iran, Teheran Province, Chemchak, Alborz Mts., MNHN Collection) and in Pamyr (valley of the Pjandz River: Narzikulov 1970) the species in question has been recorded at the altitude of about 2000 m.a.s.l.

Among all species belonging to the tribe of Siphini, *S. (S.) flava* has been recorded at the highest altitudes: in Mexico, de Cuernavaca, a submountain range of the Sierra del Chichinautzin at the altitude of 2500 m.a.s.l.; and in Peru, Junin Province in the Andes, at the altitude of 3500 m.a.s.l. (MNHN Collection).

Cladistic analysis

The list of characters and character states used in the phylogenetic analysis is shown in Table 3; the character state matrix is shown in Table 4; (0) represents the plesiomorphic state, (1) to (2) represent the derived character state, (?) corresponds to missing data. Numbers for characters (in square brackets) correspond with those used in Table 3 and the text below. The estimation of characters (plesiomorphic and apomorphic states) used in phylogenetic analysis is quoted after HEIE 1987; SHAPOSHNIKOV 1987 and WOJCIECHOWSKI 1992.

Table 3. Characters and character states used in the cladistic analysis

0. Number of antennal segments: (0) 6; (1) 5; (2) 5 or 4
1. Secondary rhinaria in alatae: (0) numerous, in few rows; (1) not numerous, in one row
2. Terminal process: (0) short, shorter or a bit longer than the base; (1) long, much longer than the base
3. Eyes: (0) normal; (1) placed on lateral, prominent extension
4. Connection of head and prothorax: (0) not fused; (1) fused
5. Apical segment of rostrum: (0) short, blunt; (1) long, stilleto-shaped
6. Dorsal hairs of the body: (0) with only pointed apices; (1) with variable shape of apices
7. Dorsal cuticle: (0) reticular or spinulose structures present; (1) smooth
8. Sclerotization of the abdominal tergites: (0) membranous; (1) sclerotized
9. Connection of the abdominal tergites: (0) all abdominal tergites free; (1) abdominal tergites II—VII fused; (2) abdominal tergites I—VII fused
10. Spinules on distal part of tibiae: (0) absent; (1) present
11. Ventral hairs of the I tarsal segment: (0) 7; (1) 5—3
12. Empodial hairs: (0) pointed; (1) spatulate
13. Localization of siphunculi: (0) on abdominal segment V; (1) on abdominal segment VI
14. Shape of siphunculi: (0) short, elevated; (1) stump-shaped
15. Reticulation of siphunculi: (0) without reticulation; (1) with reticulation
16. Cauda: (0) visible; (1) covered by abdominal tergite VIII
17. Shape of cauda: (0) broadly rounded; (1) knobbed
18. Spiracles: (0) big and rounded; (1) small and rounded
19. Anal plate: (0) broadly rounded; (1) slightly emarginate
20. Shape of fore wings: (0) normal, with the apex broadly rounded; (1) long and narrow
21. Number of branches of media: (0) 3; (1) 2

22. Origin of cubitus branches: (0) close to each other; (1) far from each other
23. Pseudosensoria of oviparae: (0) roundish with small central pore; (1) roundish without central pore; (2) 8-shaped
24. Male: (0) alatae; (1) apterous
25. Genitalia of males: (0) sclerotized, well developed; (1) not sclerotized, weak developed
26. Total number of testis follicles: (0) 8; (1) 6
27. The length of accessory glands: (0) long, longest than vasa deferentia and testicular follicles; (1) short, shorter than vasa deferentia and testicular follicles
28. Aestivating forms: (0) absent; (1) present
29. Host plants: (0) deciduous trees; (1) grasses or sedges

The performed analysis resulted in the construction of 3 cladograms, with the length of 51 steps, and the values of consistency index (Ci) and retention index (Ri) of 0.64 and 0.68 respectively (Figs 26—28). These cladograms show only minor differences in the structure of taxons, and thus they shall be discussed together.

The monophyletism of the tribe Siphini has been confirmed by 12 synapomorphies: 5 segmented antennae [0]; secondary rhinaria in alatae not numerous, in one row [1]; sclerotized abdomen [8]; abdominal tergites II—VII fused [9]; 5—3 ventral hairs on the I tarsal segment [11]; small and rounded spiracles [18]; cubitus branches Cu1 and Cu2 far from each other [22]; pseudosensoria of oviparae without the small central pore [23]; apterous males [24]; testes with 6 follicles [26]; short accessory glands [27] and host plant relationships [29].

For the group of species classified under the genus *Sipha* the synapomorphic features have not been defined; the homogeneity of this group is confirmed by a single homoplastic feature: empodial hairs pointed [12]. A single homoplastic feature, i.e. the cauda knobbed [17], distinguishes the subgenus *Sipha* from the subgenus *Rungsia*. In the subgenus *Sipha* the sister clades are *S. (S.) agropyronensis* and *S. (S.) flava*, and also *S. (S.) glyceriae* and *S. (S.) littoralis*; two additional homoplastic features group the latter two species: the short terminal process [2] and the presence of a spinulose dorsal cuticle [7]. A close relationship of the above mentioned taxa is also confirmed by their geographical distribution: *S. (S.) agropyronensis* and *S. (S.) flava* are Nearctic species, while *S. (S.) glyceriae* and *S. (S.) littoralis* are Palearctic species. Furthermore, within the subgenus *Rungsia* no clear features confirming the relationship between particular species have been determined. This might be due to the fact that aphids belonging to this subgenus are morphologically homogeneous. They are characterized by the presence of long, pointed and often multiplied dorsal hairs, broadly rounded cauda and roundish pseudosensoria in the oviparae. Apart from bionomical features, also metric features, such as the length and width ratio of the apical segment of the rostrum or the ratio of terminal process on the last segment of the antenna to the base of the antenna, are also useful in differentiating particular species of the subgenus *Rungsia*. They are utilised as diagnostic features in identification

Table 4. Character state matrix

Species	Characters																													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
P. aceris	0	0	1	0	0	0	0	1	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
A. brevicornis	2	1	0	0	0	0	1	0	1	1	0	1	0	0	0	0	1	0	1	0	0	0	1	2	?	?	?	?	0	1
A. doncasteri	1	1	0	0	0	0	0	1	1	1	0	1	1	0	0	0	1	0	1	0	0	0	1	2	?	?	?	?	0	1
A. hirtellus	1	1	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	1	0	0	0	1	2	1	?	?	?	0	1
A. karakumi	1	1	0	0	0	0	1	1	1	1	0	1	0	0	0	0	1	0	1	0	0	0	1	?	?	?	?	?	0	1
A. persianus	1	?	0	0	0	0	1	0	1	1	0	1	0	0	0	0	1	0	1	0	?	?	?	?	?	?	?	?	0	1
A. serrulatus	1	1	1	0	0	0	1	0	1	1	0	1	1	0	0	0	1	0	1	0	0	0	1	2	1	0	1	0	0	1
C. paniculatae	1	1	1	1	1	0	0	0	1	2	1	1	1	1	1	0	0	1	1	1	0	1	1	2	1	0	?	?	0	1
Ch. berlesei	1	1	0	0	0	1	0	1	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	2	1	0	?	?	0	1
Ch. longirostris	1	1	0	0	0	1	1	1	1	1	0	1	1	0	0	0	0	0	1	0	0	0	1	?	?	?	?	?	0	1
Ch. massagetica	1	?	0	0	0	1	0	1	1	1	0	1	1	0	0	0	0	0	1	0	?	?	?	?	?	?	?	?	0	1
Ch. stipae	1	1	1	0	0	1	1	1	1	1	0	1	1	0	0	0	0	0	1	0	0	0	1	2	1	0	1	0	0	1
Ch. stipae subsp. setosa	1	1	1	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0	1	0	0	0	1	2	1	0	1	1	0	1
Ch. tshernavini	1	1	0	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	?	?	?	?	?	0	1
L. psammae	1	1	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	1	0	1	0	1	2	1	1	1	1	0	1
S. (S.) agropyronensis	1	1	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0	1	?	?	?	?	?	0	1
S. (S.) flava	1	1	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0	1	1	1	0	?	?	0	1
S. (S.) glyceriae	1	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	1	0	0	0	1	1	1	0	1	1	0	1
S. (S.) littoralis	1	?	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	1	0	?	?	?	1	1	0	?	?	0	1
S. (R.) arenarii	1	1	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1
S. (R.) burakowskii	1	?	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	?	?	?	?	?	?	?	?	0	1
S. (R.) elegans	1	1	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1
S. (R.) maydis	1	1	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1
S. (R.) praecocis	1	?	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	?	?	?	?	?	?	?	?	0	1
S. (R.) taurica	1	?	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	?	?	?	?	?	?	?	?	0	1
S. (R.) uvarovi	1	?	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	?	?	?	?	?	?	?	?	0	1

keys of aphids belonging to the subgenus in question, but they are not helpful in cladistic analysis. The above-mentioned pointed empodial hairs [12] (common homoplasis for the subgenera *Rungsia* and *Sipha*) cannot confirm the relationship between particular species, either, as this feature is also common in the representatives of other aphid genera and its character is parallel.

The clade which groups together the subgenera *Rungsia* and *Sipha* is a sister with reference to the remaining Siphini, for which the common synapomorphy are the 8-shaped pseudosensoria of the oviparae [23]. In this clade, the sister relationships of *Laingia* and *Caricosipha* are confirmed by 1 synapomorphy (i.e. the localization of siphunculi on the abdominal segment VI [13]) and 1 homoplastic feature (the presence of spinulose dorsal cuticle [7]). Among all of the Siphini these 2 genera are characterized by the largest number of autapomorphies: 2 for *L. psammae* (fore wings long and narrow [20], only slightly sclerotized, weakly developed genitalia of males [25]) and 4 for *C. paniculatae* (eyes placed on lateral, prominent extensions [3], fused abdominal tergites I—VII [9], the anal plate slightly emarginate [19], and 2-branched media on fore wings [21]). Furthermore, it must be highlighted that among the homoplastic features the following are extraordinary ones among the Siphini: the fusion of the head and prothorax [4], the presence of spinules on the distal part of tibiae [10], the stump-shaped siphunculi [14] in *C. paniculatae* and the membranous tergites of abdomen in *L. psammae* [8].

Another clade, confirmed by 1 synapomorphy (dorsal hairs of the body with variable shapes of apices [6]) groups the sister genera *Atheroides* (apart from one species, i.e. *A. hirtellus*) and *Chaetosiphella* (apart from one species, i.e. *Ch. stipae* subsp. *setosa*).

For aphids belonging to the genus *Chaetosiphella* (except for *Ch. stipae* subsp. *setosa*) the synapomorphy consists in the presence of a long, stiletto-shaped apical segment of the rostrum [5]; for aphids belonging to the genus *Atheroides* (except for *A. hirtellus*) it consists in the presence of the cauda covered by abdominal tergite VIII [16]. In the genus *Chaetosiphella* the sister species with reference to the remaining taxa is *Ch. stipae*, while in the genus *Atheroides* the sister species with reference to the remaining taxa is *A. serrulatus*. The homoplastic feature defining related groups of species in both genera is the terminal process, either short, or slightly longer than the base of the last segment of the antennae [2].

In the genus *Atheroides* the clade groups 4 species. A single line with 1 homoplasis (dorsal hairs of the body only with pointed apices [6]) is established by *A. doncasteri*, the sister species with respect to *A. karakumi*, *A. brevicornis* and *A. persianus* (also confirmed by 1 homoplasis, i.e. the empodial hairs pointed [12]). Sister clades are *A. persianus* and *A. brevicornis*, confirmed by 1 homoplastic feature: the presence of reticular rugose pattern of dorsal cuticle [7]. Furthermore, there has been identified an autapomorphy for *A. brevicornis*, i.e. the 4-segmented antennae [2].

Among aphids belonging to the genus *Chaetosiphella*, the position of taxa in particular cladograms is the most variable. *Ch. longirostris* is the sister species with respect to *Ch. berlesei* and *Ch. massagetica* (Figs 26, 28), and the relationship between these two species is confirmed by 1 homoplastic feature: dorsal hairs of the body only with pointed apices [6]. *Ch. longirostris* and *Ch. massagetica* are sister species with respect to *Ch. berlesei* and *Ch. tshernavini* (Fig. 27), and the relationship between the latter 2 species is confirmed by 1 homoplastic feature: empodial hairs pointed [12]. In one case, the position of *Ch. tshernavini* was changed and brought under the genus *Atheroides* as a sister species with respect to *A. persianus* and *A. brevicornis* with 1 homoplastic feature to confirm it, namely the presence of a reticular rugose pattern of dorsal cuticle [7] (Fig. 28).

An additional commentary is required with reference to the position of 2 species: *A. hirtellus* and *Ch. stipae* subs. *setosa*. In all cladograms these species have a position close to the genera *Atheroides* and *Chaetosiphella*. Among species representing the genus *Chaetosiphella*, only *Ch. stipae* subs. *setosa* has a short apical segment of the rostrum, while the remaining species are characterized by a very long, stiletto-shaped apical segment of the rostrum (synapomorphy). Furthermore, among all species belonging to the genus *Atheroides*, only *A. hirtellus* has a well visible cauda, uncovered by the abdominal tergite VIII. Moreover, the species in question resembles morphologically (but not with respect to trophic associations) the aphids belonging to the genus *Chaetosiphella*, with which it can be mistaken (e.g. *A. stipae* Börner, 1950 is the synonym of *Ch. stipae*). The morphological trees show that the position of taxa that represent these genera are variable and that the genera may not be monophyletic.

In the case of aphids, the process of evolution was taking place with various speed and in various directions in particular evolutionary lines, which results in a mosaic picture of plesiomorphic and apomorphic features in a majority of the Aphidoidea subfamilies. Moreover, some features have evolved independently, several times, in various evolutionary lines, which makes the interpretation of data still more difficult (Heie, Węgierek 2009). The Siphini are also characterized by such a mosaic structure of features. The presence of pore-shaped siphunculi or a short terminal process in some representatives of the Siphini, i.e. the features considered archaic, have appeared as secondary features and in this case provide no information about the early genealogy.

Undoubtedly, the Siphini are a group of evolutionary young aphids. This is confirmed by a number of apomorphic characteristics in their morphology (see above) and their associations with host plants. The tribe is divided into three evolutionary lines. Firstly, the monotypic genera *Laingia* and *Caricosipha* characterized by the largest number of autapomorphic features which are not found in the remaining Siphini, but which can be found in the representatives of such genera as *Periphyllus* and *Trichaitophorus*. Secondly, the genera *Atheroides* and *Chaetosiphella*, which are most diversified morphologically (their morphology resembles that of the genus *Chaitophorus*) Finally, the third evolutionary line is occupied by morphologically homogeneous genus *Sipha*.

The phylogenetic relationships within Siphini based on nuclear genes elongation factor 1-α (EF-1α), 18S rDNA, mitochondrial genes cytochrome oxidase I and II (COI and COII) and nicotinamide adenine dinucleotide dehydrogenase 1 (ND1) match estimates based on morphological data quite well (WIECZOREK, KAJTOCH in press). In this study nine Siphini species (*A. hirtellus*, *A. serrulatus*, *C. paniculatae*, *Ch. stipae*, *L. psammae*, *S. (S.) flava*, *S. (R.) arenarii*, *S. (R.) elegans* and *S. (R.) maydis)* were used and molecular data were analysed separately and jointly with the morphological and ecological characters. The monophyly of the tribe Siphini was supported. Within the genus *Sipha* the division into subgenera was also quite well supported, as well as sister relationships between the genera *Atheroides* and *Chaetosiphella*. According to the morphological trees *A. hirtellus* is more distant to all other *Atheroides* (Figs 26—28). This discrepancy is absent in molecular trees where *A. hirtellus* and *A. serrulatus* form one clade, sister to *Ch. stipae*.

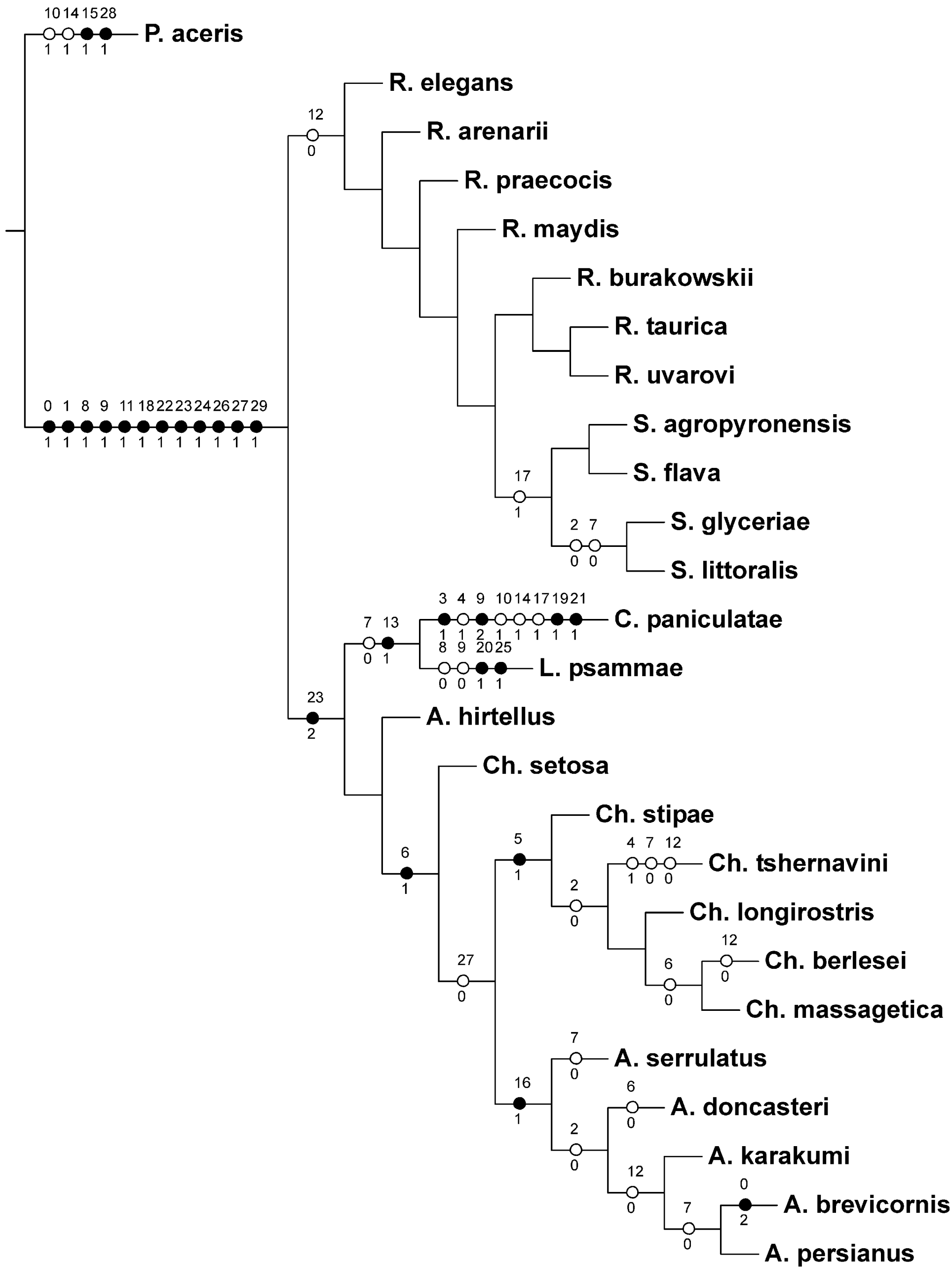


Fig. 26. Phylogenetic trees of Siphini reconstructed using morphological characters
The cladogram (Length: 51 steps; consistency index: 0.64; retention index: 0.68) was obtained with the program NONA. Black circles correspond to synapomorphies, white circles to homoplasies; numbers for characters correspond to those used in Table 3 and the text

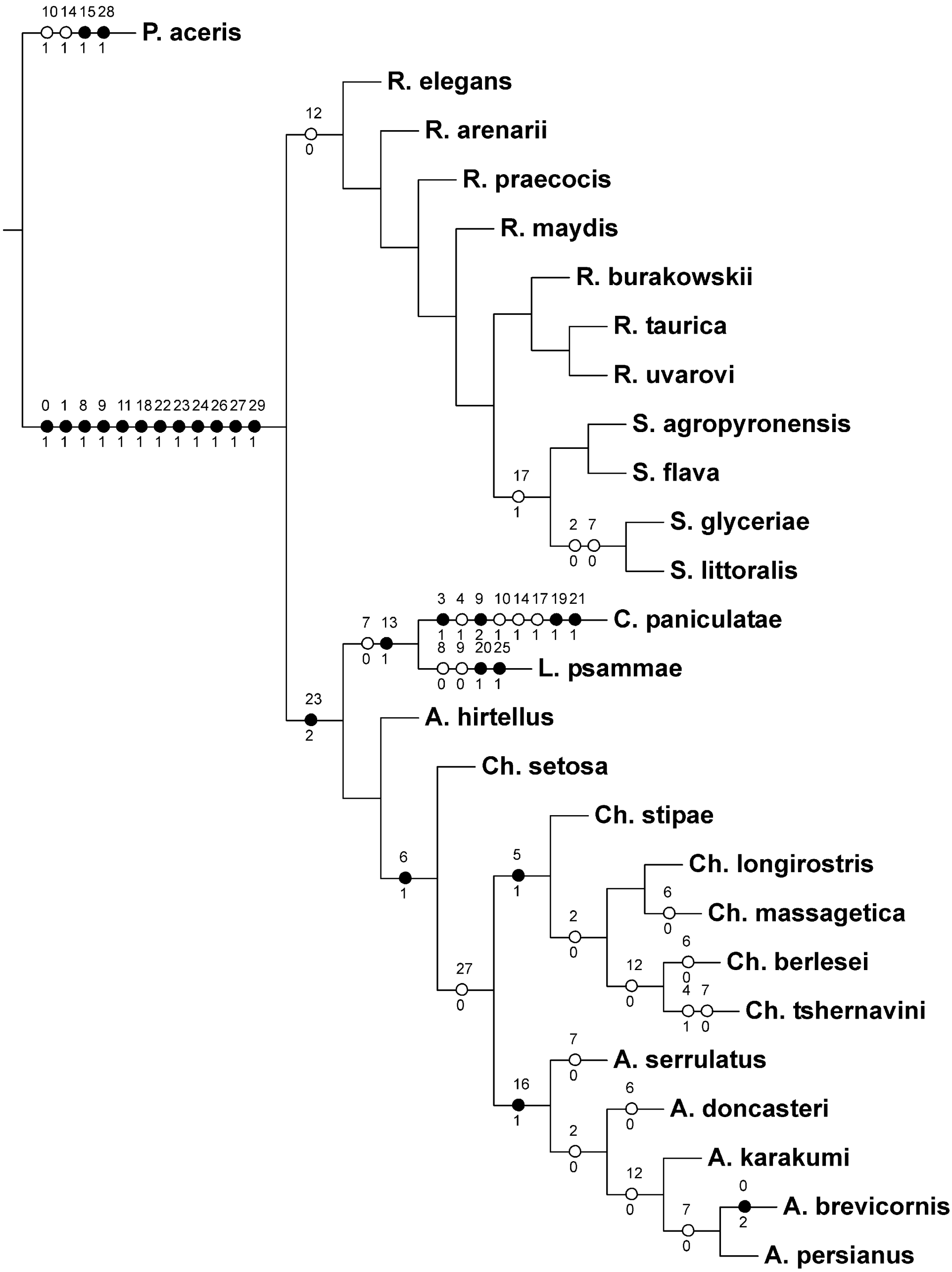


Fig. 27. Phylogenetic trees of Siphini reconstructed using morphological characters
The cladogram (Length: 51 steps; consistency index: 0.64; retention index: 0.68) was obtained with the program NONA. Black circles correspond to synapomorphies, white circles to homoplasies; numbers for characters correspond to those used in Table 3 and the text

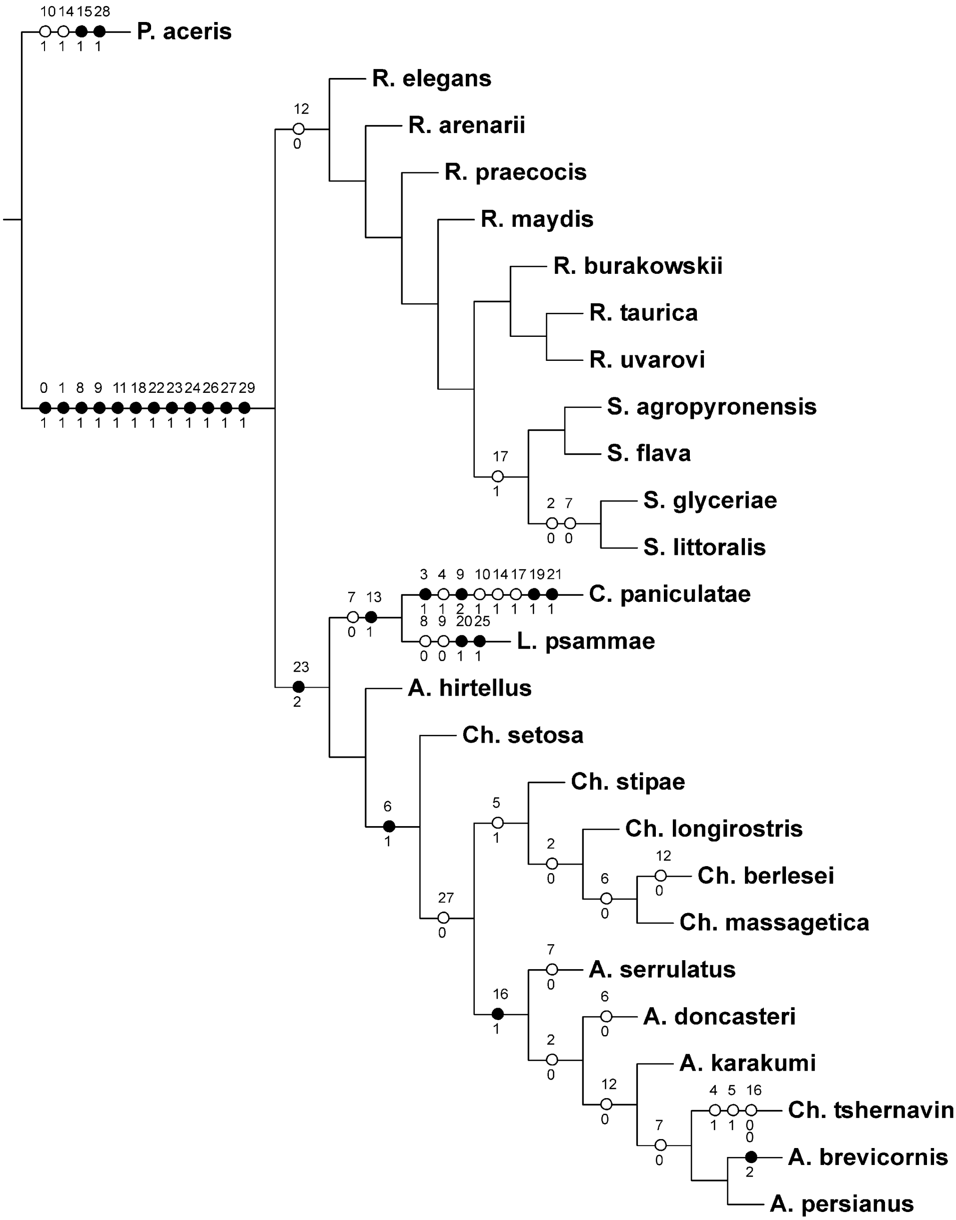


Fig. 28. Phylogenetic trees of Siphini reconstructed using morphological characters
The cladogram (Length: 51 steps; consistency index: 0.64; retention index: 0.68) was obtained with the program NONA. Black circles correspond to synapomorphies, white circles to homoplasies; numbers for characters correspond to those used in Table 3 and the text

Phylogenetic relationships within the subfamily Chaitophorinae and the origin of the Siphini

Among aphids that belong to the subfamily Chaitophorinae, the representatives of the tribe Chaitophorini are trophically associated with trees: genus *Chaitophorus* with willows (*Salix* L.) and poplars (*Populus* L.), genera *Periphyllus*, *Trichaitophorus* and *Yamatochaitophorus* mainly with maples (*Acer* L.). The Siphini, another tribe belonging to this subfamily, is associated mainly with the Poaceae and Cyperaceae. According to the commonly accepted view, aphids, in the course of their historical development moved from phylogenetically older to phylogenetically younger plants (Mordvilko 1934; Eastop 1979; Heie 1996). The most significant change in the Cretaceous terrestrial ecosystems was the appearance of angiosperms, which reached a high level of diversification in the Upper Cretaceous period, providing new trophic possibilities for the insects feeding on them (Stanley 2002). The shaping of aphidofauna was also dependent on the newly coming into existence vegetation formations, and many new aphid genera appeared nearly simultaneously in the late Cretaceous period and at the break of the Cretaceous and Paleogene periods (Wojciechowski 2003; Quednau 2004; Heie, Węgierek 2009). Therefore, the origin of aphids, the Chaitophorinae included, has to be studied in close connection with their associations with host plants.

Among host plants of the Chaitophorinae, the group which appears the earliest in paleontological data is that of the Salicaceae, as it appears in the late Cretaceous period, in areas connected with the subtropical climate. The subgenus *Salix* and the closely related to it genus *Populus* are considered phylogenetically old, as their representatives come from early Paleogene (Skvortsov 1999). The oldest fossil species representing the genus *Acer* from Eurasia and North America originate from Paleocene (Wolfe, Tanai 1987). From the same period there also comes the pollen of fossil grasses from South America and Africa, but the ancestors of this plant family had appeared earlier, probably already in the Cretaceous period (Kellogg 2001). Lowland tropical forests which, due to climactic changes, developed into communities resembling savannas, are considered the place where grasses came into being. The mountains (above the upper forest border) are indicated as an alternative place of their origin, from where they spread over other areas, adapting themselves to various habitats (Mizianty 1995 and the literature cited therein). Fossil representatives of the Cyperaceae come from Eoecene (Cusset 1996). In early Paleogene (Paleocene and early Eocene) the climate was hot and large areas were covered with tropical forests.

In late Eocene there took place significant geological and climactic changes, which had an enormous influence on the flora and fauna. These changes concerned the location of lands and seas around the poles. The separation of South America and Australia from Antarctica in the proximity of the South Pole resulted in the circulation of the Antarctic Circumpolar Current, gradual cooling down of climate and the expansion of glaziers. In the northern hemisphere the Mid-Atlantic Rift was further developed, Greenland got separated from North America and the Atlantic and Arctic Oceans were joined, which activated cold sea currents. Furthermore, in the northern part of Eurasia there disappeared the system of epicontinental seas joining the Arctic and Tethyan Oceans (Akhmetiev, Beniamovski 2009). In Oligocene there took place vast orogenic movements, which lead to the development, among others, of such mountain ranges as the Alps, the Carpathians, the Himalayas and the Cordillera, which resulted in establishing new conditions for plant migration. As a consequence of these processes the climate was gradually cooling down, and large areas of land became dry (Stanley 2002). The forests underwent the process of diversification and new species developed, i.e. ones that were less impervious to cold. In northern Eurasia the evergreen forests were replaced by various species of coniferous trees and dicotyledonous trees and shrubs representing the families Juglandaceae, Betulaceae, Fagaceae, Aceraceae, Ulmaceae and Rosaceae (Akhmetiev, Beniamovski 2009). Tropical forests of North America and Europe were initially replaced by dry tropical and subtropical forests with grassy clearings. In early Miocene, small patches of herbaceous vegetation, similar to contemporary steppe and savannah communities, began to expand rapidly. There took place the radiation and expansion of grasses with C_3 type of photosynthesis, which could spread over long distances thank to their anemophily (Ryszkiewicz 1995). In late Miocene there took place the expansion of grasses rich in silica, characterized by the C_4 type of photosynthesis, immune to warm and dry climactic conditions found in the steppes and savannahs at that time (Kellogg 2001; Stanley 2002). In Eurasia the steppe zone was spreading north from the Black Sea, through Kazakhstan to the southern part of Western Siberia (Velichko, Spasskaya 2002). In Oligocene and Miocene there took place strong diversification of maples, and their flora in Europe and North America at the time was much richer than it is nowadays (Renner et al. 2008). In Pliocene the climate was still cooling down. In Arcto-Tertiary geofloras there could be encountered numerous representatives of the Salicaceae (poplars and various species of woody willows), both morphologically and ecologically adjusting themselves to the conditions of the temperate and cool climate (Boratyński, Boratyńska 1990). In late Pliocene they settled in eastern Europe, Caucasus and Siberia, and the differentiating of particular taxa was probably taking place in many regions of Holarctics rather than in one specific centre (Skvortsov 1999).

The process of further cooling down of climate was at its peak in the subsequent period, i.e. Pleistocene, and significantly influenced the vegetation of northern hemisphere, especially in the areas situated north off 30° northern latitude. Periodical repetition of cold glacial periods and warmer interglacial periods resulted in the movement of vegetation zones to the areas situated out of the glazier range; according to the studies on the spreading of fossil pollen, it were not the whole plant associations that migrated, but rather individual species which migrated independently (Stanley 2002). Pleistocene glaciations encompassed mainly Europe, northern Siberia and North America, but most significantly influenced the flora of Europe, where the mountain ranges were stretching latitudinally and therefore the vegetation could survive the expansion of the glazier only in few, isolated localities or refugia in the Mediterranean Sea basin. The vegetation which developed in front of the ice sheet represented a type of glacial tundra with such species as polar willow, Lapland willow and steppe elements, which migrated from Asia — representatives of the genera: *Poa*, *Festuca* and *Stipa* (Podbielkowski 1977). In Younger Dryas, steppe associations stretched over areas situated on the Black Sea coast and reached further towards France (Mojski 1993). Therefore, in spite of a strong influence of the ice sheet on climatic and geomorphological conditions, the plants on which the Chaitophorinae fed might potentially survive in the area in question.

In Europe the postglacial fauna was shaped in Holocene during 5 periods: preboreal, boreal, Atlantic, subboreal and subatlantic one, as a result of resettlement of the areas from which the glazier had receded (Fanta 2005). Representatives of the Salicaceae, highly immune to the cold climate, had already appeared in the last glacial period, and the dramatic climactic fluctuations lead to the development of a numerous group of new species (Boratyński, Boratyńska 1990). Among grasses, a comparatively new element of the last glacial or the preboreal period might comprise the species with wide Circum-Boreal or Euro-Siberian ranges, such as *Catabrosa aquatica*, *Leersia oryzoides*, *Phalaris arundinacea*, *Phragmites australis*, *Poa palustris* and *Leymus arenarius*. Many grass species (i.a. *Agrostis canina*, *A. capilaris*, *Alopecurus pratensis*, *Deschampsia caespitosa*, *Phleum pretense*, *Poa pratensis*, *P. trivialis*) have some well-developed ranges in Eurasia, stretching northwards and characterized by immunity to severe climate, so it may be speculated that they were present also during the last glacial period and thus might be an old element of the flora. *Stipa capillata* is also associated with the preboreal period, being a boundary element between the Euro-Siberian and Iran-Turanian elements, while *Aira caryophyllea* and *Corynephorus canescens*, associated with the Atlantic Province, might appear considerably later in the areas from which the glazier has receded, i.e. in the Atlantic period (Zając, Zając 2002). The above-mentioned grass species are host plants for a majority of aphids belonging to the tribe Siphini. Also in the Atlantic period, in the area of Europe where the glazier had receded, there appeared maples (Podbielkowski 1977). Tertiary flora of Asia and North America was influenced by the Pleistocene glaciations to a lesser degree. In Southeast Asia, the flora did not undergo any major changes, and also in the areas south off the Caspian Sea there were preserved its refugia. In North America, a decisive factor was the longitudinally stretching mountain ranges, which were facilitating the withdrawal of vegetation southwards. Moreover, in Pleistocene there existed a land connection between Asia and North America (Beringia), which provided the possibility of exchanging flora and fauna (Stanley 2002).

In the absence of data in the fossil material it is difficult to draw conclusions about the ancestors of the Chaitophorinae and the genesis of this group of aphids. The only fossilised individual, representing the genus *Chaitophorus* and originating from late Pliocene/early Pleistocene has been reported from Greenland, from the Kap København Formation (Heie 1995). However, there are known some taxons (family Drepanochaitophoridae from the Eocene Fushun Amber), whose morphology shows some features of the Chaitophorinae (nonciliated rhinaria, small, rounded secondary rhinaria and a rounded anal plate) and drepanosiphoid aphids (i.e. the presence of frontal and marginal tubercles on the head, or wax glands plates Zhang, Hong 1999), which may indicate that these features probably have not developed independently, but were present in a common, drepanosiphoid ancestor. According to Quednau (2004), this ancestor resembled aphids of the genera *Taiwanaphis* and *Lizerius*, and it was comparatively early that from the common trunk of drepanosiphoid aphids (also called a free-living "drepanosiphoid" type of aphids by Shaposhnikov (1987)) there diverged the Drepanosiphinae and the Chaitophorinae (Chaitophorini), considered to be sister and relatively phylogenetically young groups (Quednau 2004, 2010; Heie, Węgierek 2009). Close relationships between these subfamilies are reflected by similarities in their morphology (i.a. absence of sclerotisation of segment II of the rostrum, absence of wax glands), anatomy (i.a. gastrointestinal tract without a filter chamber, similar types of male reproductive system) or bionomy (associations with host plants, similar type of summer diapause).

Aphids have achieved an evolutionary success by adjusting their life cycle to seasonal changes of host plants, mainly by avoiding unfavourable trophic conditions in the middle of summer. This strategy entails: higher reproduction speed in spring and autumn which becomes lower in summer, shortening of the life cycle, feeding on various parts of host plants or in galases (Heie 1980; Shaposhnikov 1987). One of the applied strategies included the change of a host plant, a process in which the specialisation of fundatrices played a major role. A low level of such specialisation allowed for a complete association with a new host plant (which was often very different ecologically and biochemically from the previous one), the adaptation of new niches and the development of new species. On the other hand, a high level of fundatrix specialisation lead to heteroecy, i.e. the seasonal change of a host plant (Moran 1988).

Aphids belonging to the subfamily Chaitophorinae are monoecious, i.e. they do not change host plants in their life cycle, however, at some point in their genealogy there took place a complete shift from feeding on woody plants (Chaitophorini) to feeding on grasses and sedges (Siphini). Within the Chaitophorini, aphids of the genus *Periphyllus* are characterized by a number of primary morphological features, such as: segmented, partially membranous abdomen, broadly rounded cauda, pointed hairs arranged in clear rows, large number of ventral hairs (7—6), closely situated initial parts of cubital veins in the fore wings. The males of nearly all species are alatae, with strongly sclerotized and well visible claspers and valves; they are characterized by the largest number of testicular follicles (i.e. 8) within the Chaitophorinae, and by well-developed accessory glands. A majority of species belonging to this genus are tightly associated with their host plants (monophagous or narrow oligophagous), which indicates a long association with maples. The fundatrices of this aphid genus clearly differ from other apterous generations (they are larger, thickly covered with hairs, often with a sack-like body) which indicates a higher level of their specialisation and a tight association with the host plant, especially in the context of the peculiar life cycle of these aphids. At present, the genus in question includes about 50 species, out of which over 30 have been reported from India, Pakistan and East Asia (including many endemic ones), 15 have been encountered in Europe, 2 in Central Asia, and only 3 species are native of North America. Seemingly, the species most closely related to the genus *Periphyllus* are those belonging to the genera *Trichaitophorus* (7 species) and *Yamatochaitophorus* (1 species), feeding on maples and so far recorded exclusively in India and East Asia. This seems to be confirmed by a similar setal pattern in alatae morphs and especially in embryos (dorsal hairs growing in 4 longitudinal rows and pleural hairs growing only on mesothorax) of aphids that belong to these genera, and by their associations with host plants (Chakrabarti, Mandal 1986). *Trichaitophorus* and *Yamatochaitophorus* are also characterized by a number of features untypical of other representatives of the Chaitophorini, i.a. clearly visible, laterally located tubercles at the frons or the absence of pleural and spinal dorsal hairs in apterous viviparous females of some representatives of the genus *Trichaitophorus*. On the other hand, such features as: short 6- or 5-segmented antennae, head fused with the prothorax in apterous morphs, short, often pore-shaped siphunculi without reticulation, bear a clear semblance to the Siphini. The few known male specimens of aphids belonging to the genus in question are also apterous.

According to Szelegiewicz (1961) and Chakrabarti and Mandal (1986), *Chaitophorus* is the original genus in the evolution of the Chaitophorinae. The above-mentioned paleobotanical features also indicate so. Within the angiosperms, the family Salicaceae, and especially the genus *Salix*, is considered to be evolutionally old, and representatives of this family became strongly diversified as early as at the beginning of Paleogene, migrating to the areas located in higher geographical latitudes and adjusting themselves to the gradual cooling down of climate. Also aphids of the genus *Chaitophorus*, inhabiting willows and poplars, underwent morphological diversification in the course of this process. Among other features, they are characterized by a strongly sclerotized abdominal tergites (in apterous morphs), usually with visible sculpture, hairs with varied shapes of apices (apart from the pointed ones also blunt, jagged or forked ones), usually multiplied and located in transverse rows, 7—5 ventral hairs on the first tarsal segment, empodial hairs pointed, the cauda usually knobbed. In embryos, dorsal hairs are usually located in 6 longitudinal rows, and pleural hairs run from the mesothorax up to the abdominal tergite V. The males may be both alatae and apterous (even within the same species — e.g. *Ch. salijaponicus* subsp. *niger*) with sclerotized claspers and valves. The species studied so far had 6 or 4 testicular follicles, and the accessory glands of varied length (from very long to short), while the ejaculatory duct might be well developed or shortened. The fundatrices of the genus in question are not clearly different from apterous viviparous females, which may indicate that they are not highly specialised and as a result can become associated more easily with a new host plant. Within the Chaitophorini, aphids of the genus *Chaitophorus* are characterized by the widest trophic spectrum; apart from monophagous and narrow oligophagous a large group among them comprises wide oligophagous, but the species feeding on willows never settle on poplars or the other way round. Moreover, the genus in question is the only one within the Chaitophorinae, in which some forms feed on the roots of their host plants (e.g. *Ch. hypogeus* Schout. feeds on the subterranean parts of the *Salix repens* L. subsp. *rosmarinifolia*), which provides them with more stable conditions and in the past might be one of the survival strategies applied under unfavourable conditions by the aphids of the genus *Chaitophorus* alongside the change of a host plant (from woody willows to shrub willows). Presently the genus in question comprises about 90 species, out of which 20 have been reported from India, Pakistan, East Asia, Siberia and Central Asia, Europe and North America.

As has already been mentioned, in Miocene there took place the radiation and expansion of grasses, which became the main element of plant ecosystems at the time and a new group of host plants for aphids. At present about 250 aphid species feed on grasses, and the Poaceae are the fourth most numerous group of their host plants (Eastop 1986). Among the aphids feeding on grasses there are both monoecious genera (e.g. *Diuraphis*, *Israelaphis*) and dioecious genera (e.g. *Anoecia*, *Baizongia*). Within the same genus there can be encountered both monoecious and dioecious species (e.g. *Sitobion*, *Tetraneura*); a large group is that of anholocyclic species, feeding on roots (e.g. *Aploneura lenticsi* (Pass.)) (Blackman, Eastop 2006).

The Siphini, similarly to the remaining representatives of the Chaitophorinae, include mainly species that are monoecious (with a few exceptions, e.g. *S. (S.) flava*), holocyclic and always feeding on the above ground organs of grasses and sedges. The appearance of the Siphini might be connected with the new host plants — most representatives of the Siphini feed on grasses with the C_3 type of photosynthesis, i.e. the subfamily Pooideae. The Siphini are characterized by the abdominal tergites sclerotized, often with visible sculpture (*Caricosipha*, *Laingia*, subgenus *Sipha*, some species of the genera *Atheroides* and *Chaetosiphella*), hairs located in visible rows, often multiplied, with various shapes of apices (apart from pointed ones also blunt, jagged or forked ones in some species belonging to the genera *Atheroides* and *Chaetosiphella*), pointed or spatulate empodial hairs, knobbed or broadly rounded cauda. Embryos of the Siphini have the same pattern of dorsal hairs as the embryos of aphids belonging to the genus *Chaitophorus*, while the males are always apterous. In the species studied so far a testis contained 6 follicles, accessory glands had diversified lengths (from very long to short), and the ejaculatory duct was usually shortened. Thus, the Siphini are characterized by a group of features which are also present in the aphids of the genus *Chaitophorus*, and at the same time there can be observed in them the reduction of antennae segments (which are 5- or 4-segmented) and ventral hairs on I tarsal segment (to 5, 4 or 3), sclerotization of abdominal tergites (from the membranous ones in the genus *Laingia*, partly membranous ones in *A. karakumi* to completely sclerotized ones in other representatives of the tribe in question) and their fusion (I—VII in *Caricosipha*, II—VII in other representatives of the tribe), as well as the varying size of siphunculi (from the stump-shaped ones in *Caricosipha*, through the slightly elevated ones in *Chaetosiphella* and *Sipha* to short, pore-shaped ones in *Atheroides* and *Laingia*), without reticulation. Moreover, the genus *Caricosipha* is characterized by the presence of small spinules on the tibia (similarly to aphids of the genus *Periphyllus*) and the fused head and prothorax in apterous morphs (as in *Trichaitophorus* and *Yamatochaitophorus*). The least diversified morphologically is the genus *Sipha*, while the genera *Atheroides* and *Chaetosiphella* show a number of common features, such as the varied shapes of dorsal hairs, the cuticle either smooth or covered with clear reticulation, pointed or spatulate empodial hairs, short and usually pore-shaped siphunculi, broadly rounded cauda and 8-shaped pseudosensoria in oviparae.

Summing up (Fig. 29), ancestors of the Chaitophorinae probably originate from the common trunk of drepanosiphoid aphids, which became diversified at the break of Createcous period and Paleogene, this being connected with the appearance of new vegetation formations shaped by angiosperms. In the evolution of the Chaitophorinae the genus *Periphyllus* diverged comparatively early. A number of conservative features in the morphology of the aphids in question (see above), in comparison with the much more morphologically diversified genus *Chaitophorus*, is probably connected with a peculiar bionomic feature, i.e. the summer diapause. Many species belonging to the genus *Periphyllus*, in the unfavourable summer period produces larval forms with specific type of hairs protecting them against excessive vaporization. Such a strategy facilitates a survival under unfavourable conditions without the necessity to change the morphology of adult aphids or to switch host plants. The evolution of forms developing on maples lead to the further miniaturisation of body size, disappearance reticulation of siphunculi and reduction of dorsal hairs in apterous morphs. Such features are characteristic of aphids belonging to the genera *Trichaitophorus* and *Yamatochaitophorus*. A large group of endemic species representing the genera *Periphyllus*, *Trichaitophorus* and *Yamatochaitophorus* is associated with East Asia, so this area may be considered as the centre of their origin. Contrary to the genus *Periphyllus*, adult forms of aphids belonging to the genus *Chaitophorus* used to develop also in the course of summer, and the adjustment necessary for surviving the period consisted in the development of long, multiplied dorsal hairs, as well as feeding on various parts of host plants, their roots included. As the willows and poplars were undergoing the process of diversification, there developed many new species of aphids belonging to the genus *Chaitophorus* which, just as their host plants, are widely distributed; their diversification probably took place in many regions of Holarctics rather than in one specific centre. Together with the appearance of grass communities and the first radiation of grasses with the C_3 type of photosynthesis, there also appeared the Siphini. The issue of the centre, or centres, from which the aphids belonging to the tribe in question originated, still remains open. Contemporary representatives of the Siphini can be encountered nearly exclusively in Eurasia (locally or in stands stretching latitudinally over the whole acreage of their distributional range), in specific grass communities (steppes, xerothermic grasslands, meadows, dune habitats). Steppe formations appeared in Miocene and regardless of the climactic conditions in the following geological periods (especially Pleistocene glaciations) constituted a reservoir of host plants for aphids belonging to the tribe of Siphini. Only two Nearctic species, (*S. (S.) agropyronensis* and *S. (S.) flava*), indicate that the Siphini might originate not from the areas of grasslands in North America, but rather from the steppes of Eurasia.

Because of the absence of fossil material data with respect to the Siphini representatives (which may, among other reasons, be due to the fact that in the fossil material, i.e. the imprints with carbonized remnants in clay, limestone or other sediments, the alatae viviparous females are most often preserved, and they are rare in the case of the Siphini), the conclusions drawn about their origin, as well as the origin of the whole subfamily Chaitoporinae have a hypothetical character based on the analysis of a number of morphological, anatomical and paleobotanical data. A hypothetical diagram presenting the phylogenesis of the Chaitophorinae is shown in Fig. 29.

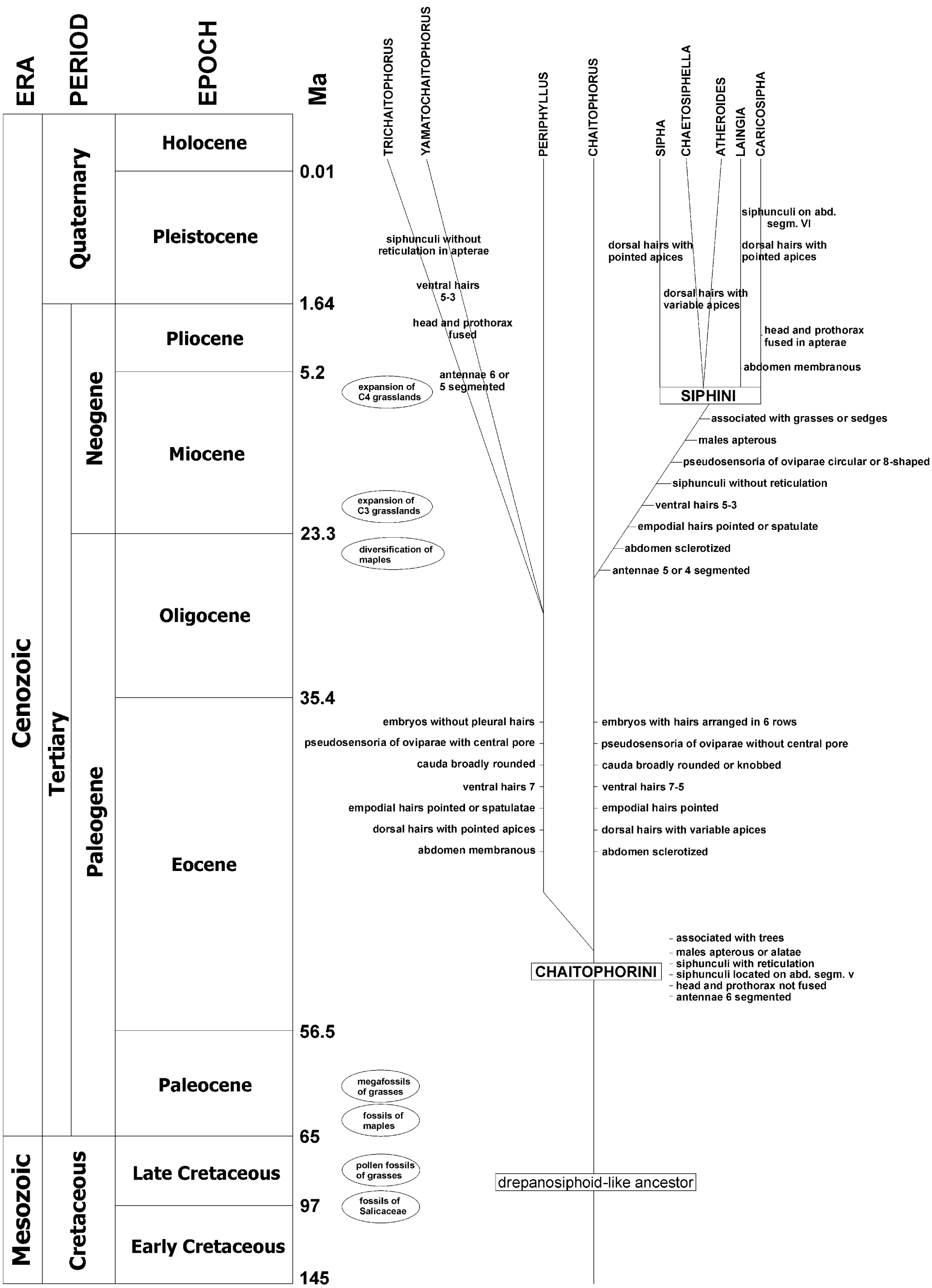


Fig. 29. The relationships within Chaitophorinae

Systematic part

Subfamily Chaitophorinae Mordvilko, 1909

Chaitophorinae MORDVILKO, 1909: 378 (Chaetophori).
Chaitophorini MORDVILKO, 1909: 378.
TYPE-GENUS: *Chaitophorus* KOCH, 1854: 1.

Siphini MORDVILKO, 1928: 180 (Siphina).
TYPE-GENUS: *Sipha* PASSERINI, 1860: 127.

Aphids belonging to the subfamily Chaitophorinae are characterized by the medium-sized body, with numerous hairs whose apices are modified in various ways. Front of head convex or straight, without tubercles. Antennae 6-, 5- or 4-segmented. Rostrum usually short, with short and blunt apical segment. Empodial hairs pointed or spatulate. Dorsum without wax gland plates. Cauda broadly rounded or knobbed. Anal plate broadly rounded or slightly emarginate. Gonapophyses 4.

The subfamily Chaitophorinae comprises about 170 species classified into 9 genera which are grouped in 2 tribes: Chaitophorini Mordvilko, 1909 (4 genera — *Chaitophorus* Koch, 1854; *Periphyllus* van der Hoeven, 1863; *Trichaitophorus* Takahashi, 1937; *Yamatochaitophorus* Higuhi, 1972) and Siphini Mordvilko, 1928 (5 genera — *Atheroides* Haliday, 1839; *Caricosipha* Börner, 1939; *Chaetosiphella* Hille Ris Lambers, 1939; *Laingia* Theobald, 1922; *Sipha* Passerini, 1860).

KEY TO TRIBES OF CHAITOPHORINAE

1. Antennae 6-segmented. Siphunculi stump-shaped with reticulation. On deciduous trees .... Chaitophorini
— Antennae 5 or 4-segmented. Siphunculi pore-shaped or slightly elewated without reticulation. On grasses or sedges .... Siphini

Tribe Siphini Mordvilko, 1928

Siphina MORDVILKO, 1928: 180.
TYPE-GENUS: *Sipha* PASSERINI, 1860: 127.

Atheroidina BÖRNER, 1930: 127.
TYPE-GENUS: *Atheroides* HALIDAY, 1839: 189.

MAMONTOVA 1959: 30 with Key; RICHARDS 1972: 2 with Key; IVANOVSKAJA 1977: 235, 236 with Key; STROYAN 1977: 33 with Key; HEIE 1982: 141—142 with Key; SZELEGIEWICZ 1977: 1985: 40—41 with Key; NIETO NAFRÍA, MIER DURANTE 1998: 348, 349 with Key; QIAO, ZHANG 2002: 756, 757 with Key.

Diagnosis: Body elongate, narrow or oval, ellipsoidal, pear-shaped 1.35—2.70 mm long. Front of head convex or almost flat, without tubercles. Head and prothorax not fused (except for *C. paniculatae* and *Ch. tshernavini*). Abdominal tergites (I)II—VII fused, sclerotized (except for *A. karakumi* and *L. psammae*). Cuticular surface smooth or densely covered with rows of short, robust or minute spinules. Head and dorsum usually hairy; setae may be long or short, thorn-like, pointed or with apices modified in various ways: flatenned, forked, jagged or fan-shaped. Antennae 5-segmented, rarely 4-segmented (*A. brevicornis*); antennal chaetotaxy well developed. The eyes (compound eyes) normal (except for *C. paniculatae*) with ocular tubercles distinct at posterior margin of eye. Legs usually short (except for representatives of the genus *Chaetosiphella*), hind legs 0.75—1.85 mm long. Distal part of tibiae without spinules (except for *C. paniculatae*). Empodial hairs pointed or spatulate. Spiracles round, placed on margin of distinct, dark pigmented or pale spiracular plates. Siphunculi pore-shaped, or slightly elevated with smooth surface (except for *C. paniculatae*). Cauda broadly rounded or knobbed. Anal plate broadly rounded or slightly emarginate.

Alatae viviparous females with abdominal tergites I—V/VI with large, oval marginal sclerites and fused pleural and spinal sclerites, tergites VII—VIII with fused marginal, pleural and spinal sclerites. Antennal segment III with

2—17 oval rhinaria lying in row in inner margin of this segment. Fore wings typical (except for *L. psammae*), with normal venation. Media with 3 or 2 branches. Pterostigma weak pigmented.

Oviparous females similar to apterous viviparous females, with more or less visible sclerotic plates on abdominal tergites and hind tibiae usually with numerous (4—67) 8-shaped, roundish or irregular shaped pseudosensoria.

Apterous males smaller than apterous viviparous females with body elongate and slender. Abdomen with sclerotic plates. Antennae long, antennal segment III with 20—49, segment IV with 5—22 oval secondary rhinaria. Genitalia well developed, strongly sclerotized, dark (except for *L. psammae*).

Key to genera of Siphini (apterous viviparous female)

1. Head and prothorax fused. Eyes prominent, placed on constricted lateral extensions of head .... *Caricosipha* Börner
— Head and prothorax not fused. Eyes normal 2
2. Abdominal tergites free, partially membranous. Siphunculi pore-shaped, placed on anterior margin of abdominal segment VI .... *Laingia* Theobald
— Abdominal tergites fused, sclerotized. Siphunculi pore-shaped or slightly elevated, placed on anterior margin of abdominal segment V 3
3. Rostrum long with apical segment stiletto-shaped .... *Chaetosiphella* Hille Ris Lambers
— Rostrum short with apical segment blunt 4
4. Body elongate, narrow, nearly linear. Cauda not visible, covered by semicircular tergite VIII .... *Atheroides* Haliday
— Body ellipsoidal, oval or pear-shaped, cauda visible 5
5. Cauda knobbed .... *Sipha* Passerini s. str.
— Cauda broadly rounded .... *Rungsia* Mimeur

Genus *Atheroides* Haliday, 1839

Atheroides HALIDAY, 1839: 189; by subsequent designation (KIRKALDY 1906: 10).
TYPE-SPECIES: *Atheroides serrulatus* HALIDAY, 1839: 189.

Atheroides HALIDAY, 1837: 218.
Corealachnus PAIK, 1971: 3—4.

LAING 1920: 39; THEOBALD 1929: 26, 27; RICHARDS 1972: 2, 3; IVANOVSKAJA 1977: 235, 236; STROYAN 1977: 36—38; SZELEGIEWICZ 1977: 96, 1985: 51; HEIE 1982: 145, 146; FOTTIT, RICHARDS 1993: 164—167; NIETO NAFRÍA, MIER DURANTE 1998: 349; QIAO, ZHANG 2002: 756, 757; WIECZOREK 2009: 693—708.

Diagnosis: Among the other representatives of the tribe Siphini the genus *Atheroides* can be distinguished by the elongate, narrow body and tergite VIII semicircular covered the cauda.

Apterous viviparous female: Body elongate, narrow, nearly linear, or oval (*A. brevicornis*). Head 0.22—0.27 mm long and 0.25—0.32 mm wide. Front of head convex. Head and prothorax not fused. Abdominal tergites II—VII fused (partially fused in *A. karakumi*), sclerotized. Cuticular surface smooth or with distinct rugose sculpture. Dorsal hairs pointed, thorn-like placed on wart-like bases which look like perforations of dark sclerite or with flattened, forked, jagged or fan-shaped apices. Head + thorax + abdominal segment I almost as long as abdominal segments II—VIII. Antennae short, 5-segmented, rarely 4-segmented (*A. brevicornis*), 0.12—0.25 times body length, with terminal process as long as base or a bit longer. Eyes normal, ocular tubercles distinct. Rostrum short, reaching to middle coxae, with apical segment short and blunt (except *A. karakumi*). Hind legs 0.75—1.42 mm long. Empodial hairs pointed or spatulate. Furcula on mesothorax usually well developed, united by wide bridge. Spiracles round, placed on margin of distinct, dark-pigmented spiracular plates. Siphunculi pore-shaped, placed on anterior margin of abdominal segment V, surface of siphunculi smooth. Cauda and anal plate broadly rounded. Tergite VIII semicircular covered cauda (except *A. hirtellus*) which is not visible from above.

Key to species of *Atheroides* (apterous viviparous female)

1. Dorsal hairs pointed 2
— Dorsal hairs with pointed, forked, jagged or fan-shaped apices 3
2. Spinal hairs very long, as long or longer as marginal ones. Cauda covered by abdominal tergite VIII. On *Deschampsia caespitosa* .... *A. doncasteri* Ossiannilsson
— Marginal hairs very long, longer than spinal ones. Cauda not covered by abdominal tergite VIII. On various grasses .... *A. hirtellus* Haliday
3. Dorsum partially sclerotic without visible sculpture. Antennal segment III with 4—8(12) long hairs. Apical segment of rostrum stiletto-shaped. On *Festuca ovina* and *Stipa lasiagrostites* .... *A. karakumi* Mordvilko
— Dorsum sclerotic with visible, rugose sculpture. Antennal segment III with 0—4 short hairs. Apical segment of rostrum blunt. On various grasses 4
4. Dorsal hairs arranged in visible rows. Hairs of abdominal tergite VIII with pointed apices. Empodial hairs spatulate .... *A. serrulatus* Haliday
— Dorsal hairs not arranged in visible rows. Hairs of abdominal tergite VIII with pointed, jagged or fan-shaped apices. Empodial hairs pointed 5
5. Body elongate, oval 1.50—2.40 mm long. Antennae 4- or 5-segmented, 0.12—0.15 body length. Antennal segment I with 2 pointed and 1 jagged hair .... *A. brevicornis* Laing
— Body elongate, slender, nearly linear 1.55—1.72 mm long. Antennae 5-segmented, 0.18—0.25 body length. Antennal segment I with 1 erected fan-shaped hair .... *A. persianus* Wieczorek

Alate viviparous female: Antennae 0.35—0.75 mm long, about 0.20 times body length (0.33—0.40 in *A. serrulatus*). Antennal segment III with 2—7 oval rhinaria lying in row in inner margin of this segment. Abdominal tergites I—V/VI with large, oval marginal sclerites and usually fused pleural and spinal ones as large, transverse plates; tergite VI with oval marginal sclerites and fused pleural and spinal ones, tergites VI/VII—VIII with fused marginal, pleural and spinal sclerites. Fore wings typical 2.10—2.20 mm long, with normal venation. Media with 3 branches. Pterostigma weak pigmented.

Key to species of *Atheroides* (alate viviparous female)

1. Dorsal hairs pointed 2
— Dorsal hairs with pointed, forked, jagged or fan-shaped apices 3
2. Antennae 0.68—0.70 mm long. Terminal process 1.25—1.28 times base Antennal segment III with 2—3 short hairs and 2—4 rhinaria. Cauda covered by abdominal tergite VIII .... *A. doncasteri* Ossiannilsson

— Antennae 0.76—0.78 mm long. Terminal process 1.50—1.55 times base. Antennal segment III with 5—6 long hairs and 6—7 rhinaria. Cauda not covered by abdominal tergite VIII .... *A. hirtellus* Haliday

3. Antennae very short, about 0.21 times body length. Terminal process very short, stumpy, 0.40—0.42 times base. Hairs of abdominal tergite VIII with pointed and flattened apices .... *A. brevicornis* Laing

— Antennae long, 0.33—0.40 times body length. Terminal process 1.25—2.00 times base. Hairs of abdominal tergite VIII with pointed apices .... *A. serrulatus* Haliday

Oviparous female: Hind tibiae weakly swallen with numerous (19—45) 8-shaped pseudosensoria located in middle part of tibiae.

Key to species of *Atheroides* (oviparous female)

1. Hind tibiae with 19—37 pseudosensoria. Dorsal hairs numerous, pointed 2

— Hind tibiae with 42—45 pseudosensoria. Dorsal hairs not numerous, with flattened or forked apices .... *A. serrulatus* Haliday

2. Terminal process about 1.37 times base. The longest antennal hair III about 1.25 times basal articular diameter of this segment. Cauda covered by abdominal tergite VIII .... *A. doncasteri* Ossiannilsson

— Terminal process about 1.27 times base. The longest antennal hair III about 3.00 times basal articular diameter of this segment. Cauda not covered by abdominal tergite VIII .... *A. hirtellus* Haliday

Apterous male: Body elongate, slender 1.42—1.56 mm long. Antennae about 0.57—1.03 mm long, 0.38—0.54 times body length. Antennal segment III with 15—35, segment IV with 6—11 rhinaria. Genitalia well developed, strongly sclerotized, dark.

Atheroides brevicornis Laing, 1920
(Figs 30, 31, 98, 99)

Atheroides brevicornis Laing, 1920: 41—42.

Atheroides aplangi Pintera, 1965: 283—284.

Theobald 1929: 34; Hille Ris Lambers 1939: 79—81; Mamontova 1959: 33; Shaposhnikov 1964: 544; Müller 1969: 63; Stroyan 1977: 38; Szelegiewicz 1977: 98; Heie 1982: 146; Wieczorek 2009: 694—696.

Diagnosis: Among representatives of the genus it can be distinguished by the oval shape of the body, dorsal chaetotaxy, short antennae (usually 4-segmented) and very short, stumpy terminal process.

Redescription: apterous viviparous female (Fig. 30a): coloration of live specimens: brown or black (LAING 1920); pigmentation when mounted: yellowish except for apices of antennae and tarsi which are dusky, or body black. Body elongate, oval 1.50—2.40 mm long and about 0.82 mm wide. Head about 0.25 mm long and 0.30 mm wide. Proportion of thoracic segments I:II:III — 0.30:0.25:0.15. Cuticular surface with very visible rugose sculpture (Fig. 30b). Dorsal chaetotaxy: hairs not arranged in visible rows. On margin of thorax and abdominal tergites I—V hairs with flattened apices 0.01—0.025 mm long; on margin of abdominl tergites VI and VII hairs with forked or flattened apices 0.04 mm long (Fig. 30c). Across dorsal tergites numerous, short, fan-shaped hairs 0.01—0.025 mm long (Fig. 30d). Abdominal tergite VIII with 9—13 pointed hairs 0.075—0.1 mm long, in the middle, two of them much longer 0.125—0.15 mm long; between these long ones two short hairs 0.03—0.05 mm long with flattened or forked apices (Fig. 30e). Head chaetotaxy: 3 of hairs pointed 0.04—0.05 mm long near frontal margin, 1 or 2 hairs with flattened or forked apices 0.06 mm long close to base of each antenna; all over head numerous fan-shaped hairs 0.025 mm long. Antennae (Fig. 30f) reaching to anterior margin of prothorax, 4 segmented (segment III and IV connected), rarely 5 segmented, about 0.12—0.13 times body length. Terminal process (Vb) very short, stumpy, about 0.6 times base (Va); other antennal ratios: Vb:III 0.20—0.40, V:III 1.60—1.70, V:IV 2.0—2.40. Antennal chaetotaxy: segm. I with 3 hairs (2 pointed and 1 jagged), segm. II with 1 hair, segm. III with 0 hairs, segm. IV with 1 hair opposite small primary rhinarium, Va with 1 hair, tip of Vb with 4 small sense-hairs. Antennal hairs very short. Apical segment of rostrum (ARS) (Fig. 30g) blunt, 0.06—0.12 mm long, 1.00—1.20 times antennal segment III and 0.70—1.0 times segment II of hind tarsus (HT II). First tarsal chaetotaxy 4:4:4, empodial hairs pointed (Fig. 30h). Cauda with 3 hairs 0.05—0.075 mm long.

Measurements of 1 specimen (in mm): (England, found amongst *Atheroides hirtellus* in the general collection of the B.M., 30.10.1919, leg. F. Laing, Holotype) body: 2.30, ant.: 0.35, ant. segm. (III—V): 0.09:0.04:(0.06+0.03), ARS: 0.11, HT II: 0.13.

Redescription: alate viviparous female: coloration of live specimens: not observed; pigmentation when mounted: dark except for antennal segment III and tibiae which are dusky, dorsal sclerites yellowish. Body elongate, oval, about 1.75 mm long and about 0.70 mm wide. Abdominal tergites I—V with oval, large marginal sclerites and fused pleural and spinal sclerites, among them small, longitudinal intersegmental plates; tergites VI—VIII with fused marginal, pleural and spinal sclerites (Fig. 31a). Rugose sculpture less visible than in apt. viv. fem., present mostly on head and abdominal sclerites. Head (Fig. 31b) and dorsal chaetotaxy: setae less numerous than in apt. viv. fem., most of them with flattened apices. Antennae (Fig. 31c) reaching to anterior margin of prothorax, 4-segmented (usually segment III and IV connected), about 0.21 times body length. Vb:Va 0.40—0.42 times; other antennal ratios: Vb:III 0.20—0.22, V:III 0.65—0.66. Antennal chaetotaxy: segm. I with 1—2 hairs, segm. II with 1 hair, segm. III with 0—1 hair. Segment III with 2—4, segment IV with 0 rhinaria. Fore wings typical (Fig. 31d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (the Netherlands: Goes, 30.06.1930, *Festuca distans*, leg. D. Hille Ris Lambers) body: 1.75, ant.: 0.37, ant. segm. (III—IV): 0.15:(0.07+0.03), ARS: 0.10, HT II: 0.14.

Oviparous female: differs from apt. viv. fem. by a little longer antennal segment III and hind tibiae with 4—31 8-shaped pseudosensoria (Pintera 1965).

Male: unknown.

Material Examined: Type material: Holotype: England, 30.10.1919, "found amongst *Atheroides hirtellus*", leg. F. Laing, 1 apt. viv. (BMNH).

Other material: 2 apt. viv. from Zoutkamp, the Netherlands (DEIC); 32 apt. viv. from Quineville (Manche), France (MNHN); 3 apt. viv., 1 al. viv. from Goes, the Netherlands, (RMNH); 6 apt. viv. from Spain (UL); 1 apt. viv. from Stenuugsund, Sweden, 17 apt. viv. from Kunmadarasi puszta, Fulophaza, Orgovany, Hungary (ZMPA).

Geographical Distribution (Map 1): Type locality: England.
Austria (near Neusiedler See: Pintera, Szalay-Marzso 1962: 127); Belgium (Middelkerke: Nieto Nafría et al. 1999: 36); Czech Republic (Palava Biosphere Reserve: Holman 1995: 193); France (Villeneuve-les-Maguelonne: Leclant 1968: 139, Quineville (Manche): Remaudieré et al. 1980: 350); Germany (Strandzone: Börner 1952: 54); Hungary (Lajosmizse: Pintera, Szalay-Marzso 1962: 129, Lajosmizse, near Kecskemet: Pintera 1965: 283—286, Kunmadarasi-puszta: Szelegiewicz 1977: 98, Hortobagy National Park: 1981: 79); Moldova (Andreev, Verescagin 1993: 16); the Netherlands (Hille Ris Lambers 1939: 79—82, Zoutkamp DEIC Collection); Norway (Hordaland, Bergen (Fana): Tambs-Lyche, Heie 1994: 72); Slovakia (Holman, Pintera 1977: 104); Sweden (Stenungsund: Ossiannilsson 1959: 389); Ukraine (Krym, Tarhankutskyj Pennisula: Bozhko 1957b: 211, Shaposhnikov 1964: 544); United Kingdom (Wales-Pembrokeshire: Hille Ris Lambers 1939: 79—82, Monymusk, Newburgh, Aberlady, Fort William, St. Cyr, Cullen, Inverness: Shaw 1964: 58, Pembroke, Merioneth, Caernarvon, Lancashire, East Lothian, Aberdeen, Inverness: Stroyan 1977: 38).

European halophilous species common mostly along salty coastal (e.g. the North Sea coast).

Host Plant: Poaceae — *Alopecurus* sp., *Deschampsia caespitosa* (L.) Beauv., *Festuca ovina* L., *F. rubra* L., *F. thalossica* Kunth, *Phleum phleoides* (L.) Karst, *Puccinellia distans* (L.) Parl., *P. maritima* (Hudson) Parl.,
Cyperaceae — *Carex distans* L.,
Juncaceae — *Juncus compressus* Jacq., *Luzula* sp.

Map 1. *A. brevicornis* — geographical distribution

Life History: The species lives on the uppersides of leaves, sitting in rows on the narrow leaves.

Atheroides doncasteri **Ossiannilsson, 1955**
(Figs 32—34, 100—102)

Atheroides doncasteri Ossiannilsson, 1955: 128—130.

Mamontova 1959: 33; Ivanovskaja 1977: 236; Szelegiewicz 1977: 97—98, 1985: 53; Heie 1982: 146—148; Wieczorek 2009: 696—698.

Diagnosis: This species can be distinguished by very long, thorn-like spinal hairs.

Redescription: **apterous viviparous female** (Fig. 32a): coloration of live specimens: dirty yellowish to brownish (OSSIANNILSSON 1955); pigmentation when mounted: yellowish. Body elongate, slender 2.33—2.56 mm long and 0.55 mm wide. Head about 0.22 mm long and 0.27 mm wide. Proportion of thoracic segments I:II:III — 0.25:0.22:0.15. Cuticular surface without visible sculpture. Dorsal chaetotaxy: hairs numerous, pointed, arranged in 3 rows. Marginal hairs 0.07–0.10 mm long, pleural ones 0.05—0.075 mm long, spinal ones 0.10—0.15 mm long; marginal and spinal hairs thorn-like (Fig. 32b,c), among them numerous, short, spiny hairs 0.02—0.04 mm long (Fig. 32d). Abdominal tergite VIII with 3 pointed hairs 0.15—0.20 mm long (Fig. 32e). Head chaetotaxy: hairs pointed, thorn-like, 0.10—0.15 mm long; on all surface of head. Antennae (Fig. 32f) reaching to middle of prothorax, about 0.20 times body length. Vb a bit longer than Va; other antennal ratios: Vb:III 0.50—0.70, V:III 1.10—1.50, V:IV 2.10—2.60. Antennal chaetotaxy: segm. I with 3—4 hairs, segm. II with 1—2 hairs, segm. III with 2—4 hairs, segm. IV with 1—2 hairs, Va with 1 hair; tip of Vb with 3 small sense hairs. Antennal hairs pointed, about 0.035 mm long; the longest antennal hair III about 1.25—2.00 times basal articular diameter of this segment. ARS blunt, about 0.07 mm long, 0.40 times antennal segment III and 0.50 times HT II. First tarsal chaetotaxy 4:4:4 or 5:5:5, empodial hairs spatulate (Fig. 32g). Cauda with 4 hairs 0.075—0.10 mm long.

Measurements of 1 specimen (in mm): (Sweden, Orebro, 6.07.1954, *Deschampsia caespitosa*, leg. Ossiannilsson, Paratype) body: 2.56, ant.: 0.54, ant. segm. (III—V): 0.16:0.08:(0.10+0.17), ARS: 0.07, HT II: 0.13.

Redescription: alate viviparous female: coloration of live specimens: not recorded; pigmentation when mounted: yellowish except for apices of antennae which are dusky. Body about 2.35 mm long and 0.60 mm wide. Abdominal tergites I—V with large, marginal sclerites, pleuro-spinal sclerites and small, oval intersegmental plates; tergites VI—VIII with fused marginal, pleural and spinal sclerites (Fig. 33a). Head (Fig. 33b) and dorsal chaetotaxy: hairs shorter and less numerous than in apt. viv. fem., on abdomen marginal and pleural ones about 0.04—0.055 mm long, spinal ones about 0.08 mm long. Antennae (Fig. 33c) reaching to anterior margin of prothorax, about 0.2 times body length. Vb: Va 1.25; other antennal ratios: Vb:III 0.20, V:III 0.66, V:IV 2.45. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 2—3 hairs, segm. IV with 1 hair. Segment III with 2—4, segment IV with 0—1 rhinaria. Fore wings typical (Fig. 33d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (the Netherlands, Swalmen, 29.06. 1936, *Aira caespitosa*, leg. H.R. Lambers) body: 2.35, ant.: 0.70, ant. segm. (III—V): 0.23:0.11:(0.12+0.15), ARS: 0.08, HT II: 0.40.

Description: oviparous female (Fig. 34a): coloration of live specimens: not recorded; pigmentation when mounted: yellowish. Body about 2.00 mm long and 0.52 mm wide. Abdominal tergites with very weakly visible sclerites. Dorsal chaetotaxy: hairs thorn-like, a little shorter than in apt. viv. fem., on abdominal tergites I—VI marginal ones 0.035—0.045 mm long, pleural ones 0.02—0.03 mm long, spinal ones about 0.075 m long, among them numerous, short, spiny hairs 0.01—0.02 mm long; on abdominal tergites VII—VIII marginal hairs 0.075—0.10 mm long and spinal ones 0.10—0.12 mm long. Head chaetotaxy: hairs pointed, thorn-like, 0.10—0.15 mm long. Antennae (Fig. 34b) about 0.21 times body length. Vb:Va 1.27; other antennal ratios: Vb:III 0.63, V:III 1.13, V:IV 2.55. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 2—3 hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs pointed, about 0.025 mm long; the longest antennal hair III about 1.25 times basal articular diameter of this segm. ARS about 0.075 mm long, 0.68 times antennal segment III and 0.65 times HT II. Hind tibiae weak swollen with about 19—21 8-shaped pseudosensoria in the middle part of tibiae (Fig. 34c). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Suecia, Upsala, 11.10.1955, *A. caespitosa* leg. Ossiannilsson) body: 2.00, ant.: 0.42, ant. segm. (III—V): 0.10:0.04:(0.06+0.065), ARS: 0.10, HT II: 0.15.

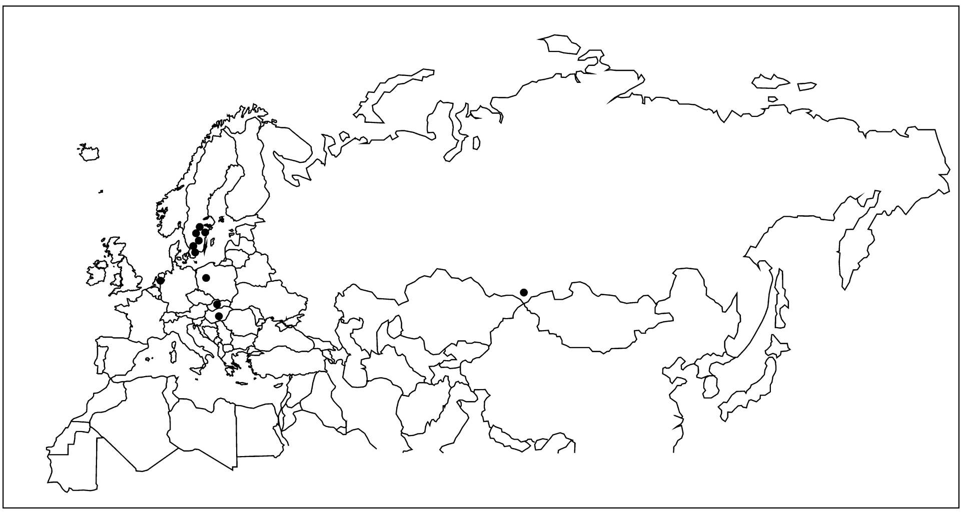
Description: male (Fig. 34d): coloration of live specimens: unknown; pigmentation when mounted: yellowish. Body elongate, slender, 1.42—1.45 mm long and 0.31—0.36 mm wide. Dorsal chaetotaxy: hairs pointed, thorn-like, arranged in 3 rows; marginal hairs on thorax and abdominal tergites I—VI 0.06—0.075 mm long, pleural ones 0.03—0.045 mm long, spinal ones 0.075—0.10 mm long; abdominal tergites VII—VIII with marginal and spinal hairs about 0.15 mm long. Antennae reaching to anterior margin of abdominal segment I, 0.38—0.41 times body length. Vb:Va 1.50—2.33; other antennal ratios: Vb:III 0.54—0.80, V:III 0.99—1.14, V:IV 1.53—2.22. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 3 hairs, segm. III with 2—3 hairs, segm. IV with 1 hair, Va with 1 hair; the longest antennal hair III about 2.50 times basal articular diameter of this segment. Segment III with 15—20, segment IV with 6—10 rhinaria. ARS about 0.06 mm long, 0.27—0.34 times antennal segment III and 0.50—0.60 times HT II. Genitalia well developed, strongly sclerotized, dark.

Measurements of 1 specimen (in mm): (18.09.1941, *A. caespitosa*, leg. C. Börner) body: 1.42, ant.: 0.57, ant. segm. (III—V): 0.175:0.10:(0.06+0.14), ARS: 0.06, HT II: 0.10.

Material Examined: Type material: Paratypes: Sweden, Orebro, 6.07.1954, *A. caespitosa*, leg. Ossiannilsson, 7 apt. viv. (BMNH), (MNHN), (ZMPA).

Other material: 5 apt. viv., 1 al. viv. from Swalmen, the Netherlands, 1 apt. viv., 1 ovip. from Upsala, Sweden (BMNH); 1 apt. viv. 6 males from Swalmen, the Netherlands (DEIC); 5 apt. viv. from Swalmen, the Netherlands (EMUC); 1 apt. viv. from Orebro, Sweden (LFC); 1 apt. viv. from Swalmen, the Netherlands (RMNH).

Geographical Distribution (Map 2): Type locality: Sweden, Markkärret (Örebro).
Hungary (Kovácsi-hegy: Pintera, Szalay-Marzso 1962: 129); the Netherlands (Swalmen: Ossiannilsson 1955: 128, 129); Poland (Wielkopolski National Park-Lake Skrzynka: Achremowicz 1972: 373); Russia (Altay-Kuralska Dale: Ivanovskaja 1977: 236, 237); Slovakia (Holman, Pintera 1977: 104); Sweden (Uppsala-Näs, Ytternäs, Vaksala, Jälla, Mariefred, Bondängen: Ossiannilsson 1959: 390).
European species known also from few localities in West Siberia. Probably the disjunctive distribution is only apparent.



Map 2. *A. doncasteri* — geographical distribution

Host Plant: Poaceae — *Deschampsia caespitosa* (L.) P. Beauv., *D. flexuosa* (L.) Trin.

Life History: The species lives on the underside of leaves; not attended by ants.

***Atheroides hirtellus* Haliday, 1839**
(Figs 35—37, 103—105)

Atheroides hirtellus Haliday, 1839: 189.

Atheroides hirtellus Haliday, 1837: 218 (ex Curtis, 1837).
Aphis hirtellus Walker, 1848: 45.

Atheroides junci LAING, 1920: 212—215.
Atheroides niger OSSIANNILSSON, 1954: 117.

LAING 1920: 43; THEOBALD 1929: 30—32; MAMONTOVA 1959: 33; SHAPOSHNIKOV 1964: 545; MÜLLER 1969: 64; STROYAN 1977: 38; SZELEGIEWICZ 1977: 97, 1985: 52, 53; HEIE 1982: 148; NIETO NAFRÍA, MIER DURANTE 1998: 350—351; WIECZOREK 2009: 698—700.

Diagnosis: This species can be distinguished by the cauda not covered by abdominal tergite VIII.

Redescription: apterous viviparous female (Fig. 35a): coloration of live specimens: dark brown to black, antennae and legs yellowish (HEIE 1982); pigmentation when mounted: dark brown to black, legs, cauda and antennal segments I—Va pale. Body elongate, oval 2.15—2.26 mm long and about 0.85 mm wide. Head about 0.27 mm long and 0.30 mm wide. Cuticular surface smooth, sculpture visible only on cauda. Proportion of thoracic segments I:II:III 0.27:0.25:0.15. Dorsal chaetotaxy: setae numerous, pointed, thorn-like arranged in 3 rows: marginal ones 0.15—0.20 mm long (Fig. 35b), pleural and spinal ones 0.10—0.15 mm long, among them numerous, short, spiny hairs 0.05—0.075 mm long (Fig. 35c). Tergite VIII with simple, pointed hairs 0.15—0.19 mm long. Head chaetotaxy: about 6—7 pointed, thorn-like hairs 0.10—0.17 mm long on apex and margin of head; towards to mid of head numerous thorn-like hairs 0.05—0.07 mm long. Antennae (Fig. 35d) reaching to anterior margin of prothorax, about 0.20 times body length. Vb about 1.20 times Va; other antennal ratios: Vb:III 0.40—0.50, V:III 0.85—1.00, V:IV 2.40—2.80. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 3—5 hairs, segm. IV with 2 hairs, Va with 1 hair; tip of Vb with 4 small sense-hairs. Antennal hairs pointed, about 0.03—0.05 mm long; longest antennal hair III about 2.50—3.00 times basal articular diameter of this segment. ARS blunt, 0.08—0.10 mm long, 0.45 times antennal segment III and 0.50 times HT II, without secondary hairs. First tarsal chaetotaxy 5:5:5, empodial hairs spatulate (Fig. 35e). Cauda with 3 hairs 0.075—0.10 mm long, not covered by abdominal tergite VIII (Fig. 35f).

Measurements of 1 specimen (in mm): (England, Surrey Richmond Park, 15.06.1974, *Deschampsia* (Poaceae), leg. V.E. Eastop) body: 2.26, ant.: 0.60, ant. segm. (III—V): 0.20:0.07:(0.07+0.09), ARS: 0.08, HT II: 0.14.

Redescription: alate viviparous female: coloration of live specimens: not observed; pigmentation when mounted: paler than apt. viv. fem., head, apices of antennae, tibiae, cauda and abdominal sclerites dusky. Body 1.93—2.01 mm long and about 0.66 mm wide. Abdominal tergites I—IV with large, oval marginal sclerites, small pleural sclerites and transverse spinal sclerites; tergites V—VI with marginal sclerites and pleuro-spinal sclerites, among them very small, oval intersegmental sclerites; tergites VII—VIII with fused marginal and pleuro-spinal sclerites (Fig. 36a). Head (Fig. 36b) and dorsal chaetotaxy:

abdominal hairs thorn-like, a little shorter than in apt. viv. fem.; on head among long, pointed hairs numerous short, spiny hairs 0.025—0.05 mm long. Antennae (Fig. 36c) reaching to posterior margin of mesothorax, about 0.20 times body length, Vb:Va 1.50—1.55; other antennal ratios: Vb:III 0.40, V:III 0.77, V:IV 2.33. Antennal chaetotaxy: segm. I with 1 hair, segm. II with 2 hairs, segm. III with 5—6 hairs, segm. IV with 1—2 hairs, Va with 1 hair. Segment III with 6—7, segment IV with 0—1 rhinaria. Fore wings typical (Fig. 36d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (England, Surrey Richmond Park, 15.06.1974, *Deschampsia*, leg. V.E. Eastop) body: 1.94, ant.: 0.76, ant. segm. (III—V): 0.27:0.09:(0.10+0.11), ARS: 0.08, HT II: 0.14.

Redescription: oviparous female (Fig. 37a): coloration of live specimens: not observed; pigmentation when mounted: paler than apt. viv. fem., abdomen and thorax pale brown, antennae and legs pale. Body 1.86—2.03 mm long and 0.83 mm wide. Thorax and abdomen with oval, dark pigmented marginal sclerites, pleural and spinal ones weakly visible as small plates. Dorsal chaetotaxy: hairs thorn-like, marginal ones 0.065—0.12 mm long, pleural ones about 0.15 mm long, spinal ones 0.19—0.20 mm long, among them numerous, short hairs 0.05—0.075 mm long. Antennae (Fig. 37b) reaching to anterior margin of prothorax, about 0.32 times body length. Vb:Va 1.37; other antennal ratios: Vb:III 0.52, V:III 0.90, V:IV 2.42. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 1 hair, segm. III with 3—4 hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs pointed, about 0.06 mm long; longest antennal hair III about 3.00 times basal articular diameter of this segment. ARS about 0.09 mm long, 0.42 times antennal segment III and 0.62 times HT II. Hind tibiae (Fig. 37c) not swollen, with 19—37 8-shaped pseudosensoria placed on middle part of tibiae. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (B.M. Dry Coll. Mounted from material named *A. hirtellus* Halid., 30.10.1919, Laing) body: 1.86, ant.: 0.53, ant. segm. (III—V): 0.17:0.07:(0.09+0.08), ARS: 0.08, HT II: 0.13.

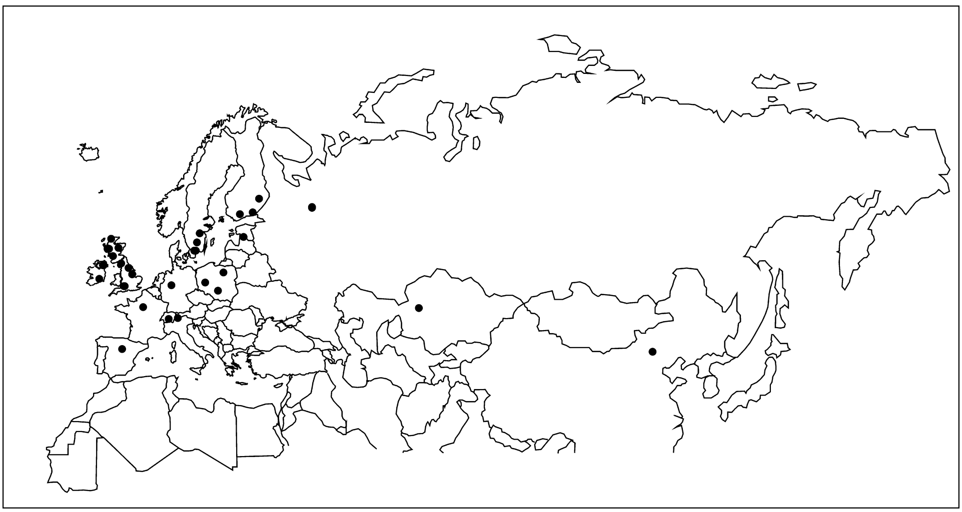
Male: dark brown to black (WALKER 1848).

MATERIAL EXAMINED: No type material traced.
Other material: 8 apt. viv., 4 al. viv. from Surrey Richmond Park, Alice Holt forest near Alton, 3 al. viv. from Rabley Green near Shenley Herts, 1 ovip. from Ayrshire Straiton, 2 ovip. from B.M. Dry Coll. mounted from material named *A. hirtellus* Halid., United Kingdom (BMNH); 5 apt. viv. from Ardentall, United Kingdom (EMUC); 2 apt. viv. from Sweden, Orebro (LFC); 1 apt. viv. from Abeeredermohre, United Kingdom (MNHN); 11 apt. viv. from Poland, Piekary Śląskie (UŚ); 1 apt. viv., 1 al. viv. from Poland, Olsztyn-Kortowo (ZMPA).

GEOGRAPHICAL DISTRIBUTION (Map 3): Type locality: England, Holywood. China (Jiling: TAO 1999: 52, Gongzhuling, Jiling Province: QIAO, ZHANG 2002: 757) Finland (Helsinki: HEIKINHEIMO 1966: 1, ALBRECHT 2007: 7); France (Villeneuve-les-Maguelonne: LECLANT 1968: 139); Germany (Rhön: BÖRNER

1952: 54); Ireland (Fota, Rossbeigh, Belfast: CARTER et al. 1987: 268); Kazakhstan (vicinity of Aksay: KADYRBEKOV 2004: 5); Latvia (Riga: RUPAIS 1989: 67); Poland (Olsztyn-Kortowo, Gorzyń near Międzychód, Trzebinia: WIECZOREK 2006—2007: 22, Piekary Śląskie, WIECZOREK 22.06.2010: UŚ Collection); Russia (MORDVILKO 1929: 92); Spain (Madrid: NIETO NAFRÍA, MIER DURANTE 1998: 349—351); Sweden (Alvesta, Örebro, Åby: OSSIANNILSSON 1959: 390); Switzerland (Valais: JÖRG, LAMPEL 1990: 357, Sion, Pfynwald (Valais): LAMPEL, MEIER 2003: 151); United Kingdom (near Lancaster, near Belfast: WALKER 1848: 45, Monymusk, Aberdeenshire: LAING 1921: 119, The Kyle-Invershin, Monymusk, Aberdeenshire, Trossachs, Perthshire, Loch Awe, Argyllshire, Oxshott, Devon, Cheshire: THEOBALD 1929: 29—33, Monymusk, Invershin, Daviot, Huntly, Inverurie, Hill of Fare, Logie Coldstone, St. Andrews, Banchony, Cults, Dinnet, Fyvie, Straiton, Bridyie of Potarch: SHAW 1964: 69).

Palaearctic species distributed from China to United Kingdom.



Map 3. *A. hirtellus* — geographical distribution

HOST PLANT: Poaceae — *Alopecurus pratensis* L., *Ammophila arenaria* (L.) Link, *Andropogon* sp., *Arrhenatherum elatius* (L.) Beauv. ex J.&C. Presl, *Deschampsia caespitosa* (L.) Beauv., *Leymus arenarius* (L.) Hochst., *Poa pratensis* L.
Juncaceae — *Juncus articulatus* L.

LIFE HISTORY: Small colonies live between the ribs of the leaf; attended by ants.

Atheroides karakumi Mordvilko, 1948
(Figs 38, 106)

Atheroides karakum MORDVILKO, 1948: 207.

Atheroides lasiagrostites JUCHNEVITSH, 1960: 218—220.

MAMONTOVA 1959: 34; SHAPOSHNIKOV 1964: 543; IVANOVSKAJA 1977: 237; WIECZOREK 2009: 700—702.

Diagnosis: Among the other species of the genus it can be distinguished by the apical segment of rostrum stiletto-shaped.

Redescription: **apterous viviparous female** (Fig. 38a): coloration of live specimens: brownish (IVANOVSKAJA 1977); pigmentation when mounted: yellowish, antennal segment Va and hind legs light brown. Body elongate, slender 1.80—2.22 mm long and 0.55 mm wide. Head 0.22 mm long and 0.30 mm wide. Proportion of thoracic segments I:II:III — 0.30:0.22:0.15. Abdominal tergites sclerotized, partially fused, with distinct membranous intersegmental lines between tergites I and II, without visible sculpture. Dorsal chaetotaxy: hairs numerous, not arranged in visible rows. Marginal hairs on thorax and abdominal tergites I—V with forked and jagged apices, 0.05—0.06 mm long (Fig. 38b), on margin of tergites VI—VII pointed or forked hairs 0.08—0.10 mm long, across abdominal tergites hairs very short, fan-shaped 0.01—0.02 mm long (Fig. 38c). Abdominal tergite VIII with 6—8 pointed, thorn like hairs 0.10—0.15 mm long, in the middle two of them with forked apices 0.075 mm long (Fig. 38d). Head chaetotaxy: pointed hairs 0.09—0.15 mm long on apex of head, towards to the mid of head row of pointed and forked hairs 0.10—0.12 mm long; numerous, short, fan-shaped hairs 0.025—0.03 mm long in middle part of head. Antennae (Fig. 38e) reaching to anterior margin of prothorax, about 0.18 times body length. Vb about 0.50 times Va; other antennal ratios: Vb:III 0.25, V:III 0.75, V:IV 1.50. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 3—8 (12) hairs, segm. IV with 1—2 hairs, Va with 1 hair, tip of Vb with 4 small sense-hairs. Antennal hairs pointed, about 0.035 mm long; the longest antennal hair III about 1.40 times basal articular diameter of this segment. ARS stiletto-shaped (Fig. 38f), about 0.11—0.125 mm long, 0.76 times antennal segment III and 0.90 times HT II. First tarsal chaetotaxy 5:5:5, empodial hairs pointed (Fig. 38g). Cauda with 3 hairs 0.05—0.075 mm long.

Measurements of 1 specimen (in mm): (Russia, 23.08.1930, Holotype) body: 1.98, ant.: 0.36, ant. segm. (III—V): 0.12:0.05:(0.05+0.03), ARS: 0.11, HT II: 0.14.

Alate viviparous female: differs from apterous viviparous female by smaller body (about 1.78 mm long) and antennal segment III with 4—6 rhinaria (IVANOVSKAJA 1977).

Sexuales: unknown.

Material Examined: Type material: Holotype: Russia, 23.08.1930, leg. E. Lupnova, 5 apt. viv., 6 juv. (ZMAS).

Other material: 6 apt. viv., 1 juv. from Kazakhstan (UASK).

Geographical Distribution (Map 4): Type locality: Kazakhstan, north seaside of the Aralskie Sea.

China (Xinjang-Uygur Region, Urumqi: Kadyrbekov et al. 2002: 27); Kazakhstan (Shaposhnikov 1964: 543, Alma-Atynska distr.: Juchnevitsh 1960: 218—220, Zaysanska Dale: 1968: 69, Central Kazakhstan: Smailova 1971: 21); Russia (Groznenska distr., Stavropolski Kray: Bozhko 1957a: 47, Caucasus, Central Asia: Shaposhnikov 1964: 543; West Siberia-Kyzyl: Ivanovskaja 1966: 196, Ulyg-Khemka Steppe: 1972: 20, West Siberia-Altay (Tashan-Tu), Isyl-Kul: 1977: 237—238).

Local species, known only from few localities in Central Asia, connected with steppe and semi-desert environments.

Map 4. *A. karakumi* — geographical distribution

Host Plant: Poaceae — *Achnatherum* (*Lasiagrostis*) *splendens* (Trin.) Nevsky, *Festuca ovina* L.

Life History: The aphids live in colonies on the undersides of leaves; attended by ants.

Atheroides persianus Wieczorek, 2009
(Figs 39, 107)

Atheroides persianus WIECZOREK, 2009: 702—703.

Diagnosis: This species can be distinguished by the small size of the body, cuticular rugose sculpture as well as dorsal, head and antennal chaetotaxy.

Redescription: apterous viviparous female (Fig. 39a): coloration of live specimens: unknown; pigmentation when mounted: yellowish to light brown except for antennal segment I, V and tarsi which are dusky. Body elongate, slender, nearly linear 1.55—1.72 mm long and about 0.45—0.60 mm wide. Head about 0.22 mm long and 0.25 mm wide. Proportion of thoracic segments I:II:III — 0.25:0.19:0.12. Cuticular surface with very visible, rugose sculpture (Fig. 39b). Dorsal chaetotaxy: hairs numerous, not arranged in visible rows. On margin of thorax and abdominal tergites I—V hairs with fan-shaped and flattened apices 0.015—0.025 mm long; on margin of abdominal tergites VI and VII hairs with flattened or forked apices 0.035—0.045 mm long (Fig. 39c). Across dorsal tergites numerous, short fan-shaped hairs 0.01—0.02 mm long (Fig. 39d), middle of tergite VII with 2 forked hairs 0.035—0.04 mm long. Abdominal tergite VIII with about 8—12 pointed and forked hairs 0.03—0.005 mm long, in middle 2 pointed hairs 0.09—0.1 mm long; between these long ones 2 hairs with pointed or forked apices about 0.05 mm long (Fig. 39e). Head chaetotaxy: 2 pointed hairs 0.09—0.10 mm long near frontal margin; numerous fan-shaped hairs 0.025—0.035 mm long all over head. Antennae (Fig. 39f) reaching to middle of prothorax, 0.18—0.25 times body length. Vb short, 0.75—0.83 times Va; other antennal ratios: Vb:III 0.45—0.66, V:III 1.10—1.53, V:IV 1.90—2.20. Antennal chaetotaxy: segm. I with 1 short, erected forked hair, segm. II with 0 hairs, segm. III with 0—1 hair, segm. IV with 0—1 hair, Va with 0 hair, tip of Vb with 4 small sense-hairs. ARS blunt 0.07—0.09 mm long, 0.75—1.10 times antennal segment III and 0.58—0.77 times HT II. First tarsal chaetotaxy 4:4:4, empodial hairs pointed (Fig. 39g). Cauda with 2 hairs 0.04—0.05 mm long.

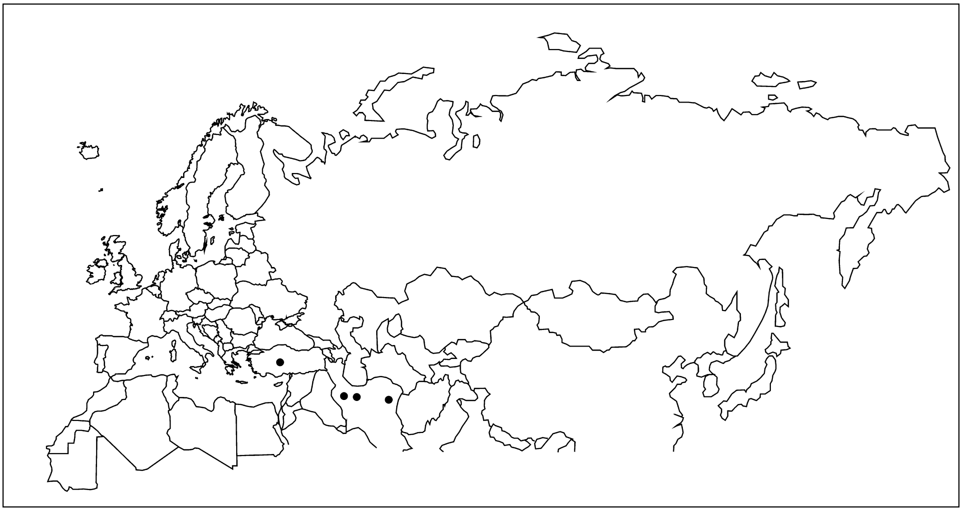
Measurements of 1 specimen (in mm): (80 km south of Ghazvin, 1500 m.a.s.l., 16.08.1955, leg. G. Remaudieré, Holotype) body: 1.70, ant.: 0.43, ant. segm. (III—V): 0.10:0.05:(0.06+0.045), ARS: 0.09, HT II: 0.12.

Alate viviparous female and Sexuales: unknown.

MATERIAL EXAMINED: Type material: Holotype: Iran, 80 km south of Ghazvin 1500 m, 16.08.1955, leg. G. Remaudieré, 1 apt. viv., no 4043 (MNHN); Paratypes: Iran, 80 km south of Ghazvin 1500 m.a.s.l., 16.08.1955, leg. G. Remaudieré, 1 apt. viv., no 4042 (MNHN), Iran, 80 km south of Ghazvin 1500 m, 16.08.1955, leg. G. Remaudieré, 1 apt. viv., no 4044 (MNHN).

Other material: about 25 apt. viv., 4 juv. from Firuzkuh and vicinity of Ghazvin, Iran, 1 apt. viv. from Karapinar, Konya, Turquie (MNHN); 1 apt. viv. from Firuzkuh, Iran (UŚ).

Geographical distribution (Map 5): Type locality: Iran, vicinity of Ghazvin.
Iran (Firuzkuh: MNHM Collection); Turkey (Karapinar, Konya Province: MNHM Collection).
Local species known only from few localities in Alborz Mts. and Taurus Mts.



Map 5. *A. persianus* — geographical distribution

Host plant and life history: Unknown – collected by sweeping from Cyperaceae.

Atheroides serrulatus Haliday, 1839
(Figs 40—43, 108—111)

Atheroides serrulatus Haliday, 1839: 189.

Atheroides serrulatus Haliday, 1837: 218 (ex Curtis, 1837).
Aphis serrulatus Walker, 1848: 47—48.
Glyphina aculeata Dahl, 1912: 3.
Sipha paradoxa Theobald, 1918: 26—27.
Atheroides festucae Mordvilko, 1934: 9.
Corealachnus suwonensis Paik, 1971: 3.

Laing 1920: 39—41, 1921: 118; Theobald 1929: 28—29; Mamontova 1959: 33; Shaposhnikov 1964: 544; Müller 1969: 64; Richards 1972: 3; Ivanovskaja 1977: 238; Stroyan 1977: 38; Szelegiewicz 1977: 98, 1985: 52; Heie 1982: 148—149; Nieto Nafría, Mier Durante 1998: 351—353; Qiao, Zhang 2002: 758—759; Wieczorek 2009: 702—706.

Diagnosis: This species can be distinguished by dorsum with distinct, rugose sculpture and dorsal hairs arranged in visible rows.

Redescription: apterous viviparous female (Fig. 40a): coloration of live specimens: yellow to yellowish brown; pigmentation when mounted: yellowish. Body elongate, slender 1.70—2.20 mm long and 0.66 mm wide. Head about 0.22 mm long and 0.32 mm wide. Proportion of thoracic segments I:II:III — 0.22:0.22:0.125. Cuticular surface with visible, rugose sculpture (Fig. 40b). Thorax and abdomen with oval, dark pigmented marginal sclerites. Dorsal chaetotaxy: thorax with fan-shaped hairs 0.015—0.025 mm long. Abdominal hairs arrange in 3 rows: marginal hairs of tergites I—V with forked and flattened apices 0.02—0.04 mm long; tergites VI—VII with flattened forked or jagged and pointed hairs 0.045—0.075 mm long (Fig. 40c); pleural and spinal ones fan-shaped, about 0.015 mm long (Fig. 40d). Abdominal tergite VIII with 11—16 pointed, thorn-like hairs 0.10—0.15 mm long (Fig. 40e). Head chaetotaxy: row of pointed, thorn-like and forked hairs 0.091—0.11 mm long present on margin of head; numerous, short pointed and forked hairs 0.025—0.03 mm long present in middle part of head. Antennae (Fig. 40f) reaching to anterior margin of prothorax, about 0.19 times body length. Vb 1.10—1.30 times Va; other antennal ratios: Vb:III 0.50—0.70; V:III 1.10—1.30, V:IV 2.20—3.50. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 1—2 hairs, segm. III with 0—4 hairs, segm. IV with 0—1 hair, Va with 0—1 hair, tip of Vb with 4 small sense-hairs. Antennal hairs pointed, short. ARS blunt, about 0.07—0.10 mm long, 0.69 times antennal segment III and 0.75 times HT II. First tarsal chaetotaxy 4:4:4 or 5:5:5; empodial hairs spatulate (Fig. 40g). Cauda with 4 0.05—0.10 mm long hairs.

Measurements of 1 specimen (in mm): (England, Berks, Wallingford, 6.06.1993, *Juncus* sp., leg. J.H. Martin) body: 1.87, ant.: 0.39, ant. segm. (III—V) 0.11:0.05:(0.06+0.07), ARS: 0.09, HT II: 0.12.

Redescription: alate viviparous female: coloration of live specimens: yellowish brown; pigmentation when mounted: yellowish; head, thorax, antennal apices and dorsal sclerites: dusky. Body about 1.70—1.85 mm long and 0.60 mm wide. Abdominal tergites I—V with large marginal sclerites, tergites I—II with separate, whereas tergites III—V with fused pleural and spinal sclerites, among them small, intersegmental plates; tergites VI—VIII with fused marginal and pleuro-spinal sclerites (Fig. 41a). Head (Fig. 41b) and dorsal chaetotaxy similar like in apt. viv. fem. with exception of pointed frontal hairs and setae of abdominal tergite VIII which are a bit longer. Antennae

(Fig. 41c) reaching to anterior margin of mesothorax, 0.33—0.40 times body length. Vb: Va 1.25—2.00; other antennal ratios: Vb:III 0.40—0.88, V:III 0.90—1.00, V:IV 2.40—2.50. Antennal chaetotaxy: segm. I with 1—2 hairs, segm. II with 1 hair, segm. III with 0—2 hairs, segm. IV with 1 hair, Va with 0—1 hair. Segment III with 3—6, segment IV with 0—1 rhinaria. Fore wings typical (Fig. 41d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Iran, 16.04.1963, leg. Remaudieré) body: 1.84, ant.: 0.75, ant. segm. (III—V): 0.23:0.11:(0.14+0.10), ARS: 0.07, HT II: 0.14.

Redescription: oviparous female (Fig. 42a): coloration of live specimens: yellowish; pigmentation when mounted: darker than apt. viv. fem. with apices of antennae and tarsi dusky. Body elongate: oval 2.00—2.35 mm long and 0.83—0.87 wide. Thorax and abdomen with big, oval marginal sclerites, pleural and spinal ones weakly visible. Dorsal chaetotaxy: marginal hairs on thorax and abdominal tergites I—VI with flattened or forked apices 0.015—0.025 mm long, tergite VII with forked hairs 0.05—0.06 mm long, tergite VIII with pointed hairs 0.075—0.15 mm long; pleural and spinal hairs flattened about 0.01 mm long. Head chaetotaxy: hairs less numerous than in apt. viv. fem. with pointed or forked apices 0.05—0.06 mm long. Antennae (Fig. 42b) reaching middle of prothorax, about 0.21 times body length. Vb:Va 0.95—1.00; other antennal ratios are: Vb:III 0.50—0.55, V:III 1.00—1.10, V:IV 3.00—3.25. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 1—2 hairs, segm. IV with 1 hair, Va with 1 hair. Hind tibiae (Fig. 42c) weak swollen with about 42—45 8-shaped pseudosensoria. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Denmark, Copenhagen Bot. Garden, 10.09.1972, leg. O. Heie) body: 2.1, ant.: 0.46, ant. segm. (III—V): 0.15:0.04:(0.07+0.07), ARS: 0.08, HT II: 0.12.

Redescription: male (Fig. 43a): coloration of live specimens: yellowish brown; pigmentation when mounted: yellowish with antennal segments III—V and tarsi dusky. Body elongate, slender, about 1.54—1.56 mm long and 0.40—0.42 mm wide. Dorsum with small marginal, pleural and spinal sclerites. Dorsal chaetotaxy: thorax and abdominal tergites I—II with flattened and forked hairs 0.015—0.03 mm long, tergites III—VI with longer hairs 0.03—0.05 mm long, tergites VII—VIII with pointed hairs 0.05—0.075 mm long; pleural and spinal hairs forked 0.01 mm long. Antennae (Fig. 43b) reaching to anterior margin of abdominal segment I, 0.45—0.54 times body length. Vb:Va 1.50—1.80; other antennal ratios: Vb:III 0.40—0.47, V:III 0.70—0.72, V:IV 1.85—1.95. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 3—4 hairs, segm. IV with 1—2 hairs, Va with 1 hair. Antennal hairs very short and fine. Segment III with 20—35, segment IV with 6—11 rhinaria. ARS about 0.075 mm long, 0.20—0.30 times antennal segment III and 0.45—0.50 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 43c).

Measurements of 1 specimen (in mm): (England, Harpenden, 29.09.1950, *F. ovina*, leg. V.E. Eastop) body: 1.54, ant.: 1.03, ant. segm. (III—V): 0.39:0.21:(0.13+0.30), ARS: 0.07, HT II: 0.11.

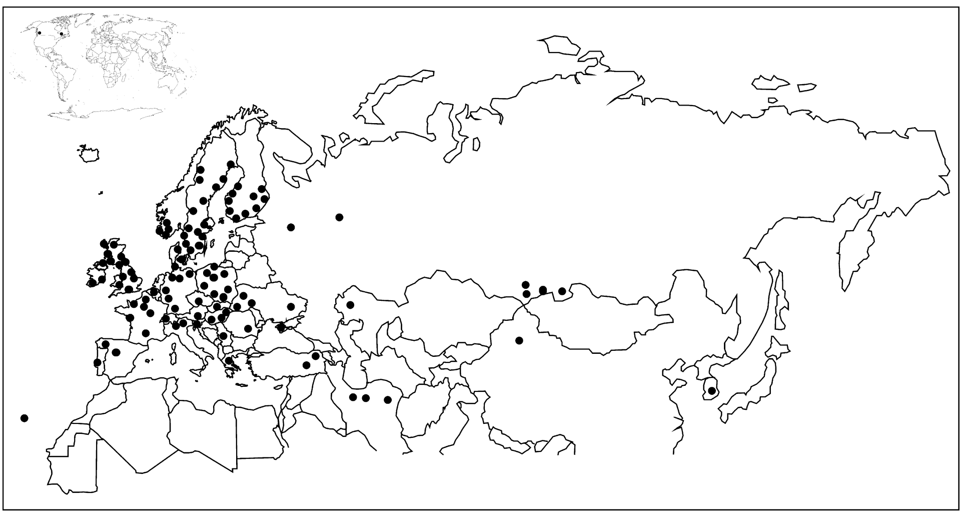
Material Examined: No type material traced.

Other material: about 17 apt. viv., 6 ovip., 3 males from Fatfield, Harpenden, Somerset, Invernarer, Derbys, Sussex, Seaford Head, Berks, Wallingford, United Kingdom (BMNH); 3 al. viv. from Gambleaux, Belgium, 15 apt. viv., 8 ovip., 4 males from Dunes de Lourdes, Gironde, H.Savoie, Villeneuve, France, 3 apt. viv., 2 al. viv. from Iran, 10 apt. viv., 1 ovip., 7 males from Tatran and vicinity of Bingöl, Turkey (MNHN); 2 apt. viv. from Brunby, Sweden (MZLU); 6 apt. viv., 1 al. viv. from Moguert, the Netherlands (RMNH); 6 apt. viv., 2 al. viv. from Villa de Buey, Huesca, Spain (UL); 4 apt. viv., 1 al. viv., 6 ovip., 5 males from Dąbrowa Górnicza, Poland (UŚ); 3 apt. viv., 1 al. viv. from Olsztyn-Kortowo, Poland (ZMPA); 2 apt. viv., 1 ovip. from Copenhagen Botanical Garden, Skallingen Jutland, Denmark (ZMUC).

Geographical Distribution (Map 6): Type locality: England, sea-cost at Holywood.

Austria (Kaiserau: Börner, Franz 1956: 313); Belgium (Nieto Nafría et al. 1999: 19, Gembloux: MNHM Collection); Canada (British Columbia, Quebec: Maw et al. 2000: 29); China (Xinjiong (Wulumuqi): Qiao, Zhang 2002: 757—759); Czech Republic (Holman, Pintera 1977: 104, Palava Biosphere Reserve: Holman 1995: 193); Denmark (Jutland, North East Zeland: Heie 1982: 149); Finland (Albrecht 2007: 7); France (Beaucaire: Leclant 1966: 121, Villeneuve la Salle H.A.,Thônes Haute Savoie, Rouen, Gironde, Le Meriot (Aube), Quineville (Manche): MNHN Collection); Germany (Börner 1952: 54, Kiel, Lauenburg, Amrum, Ruderalstellen, Adolfkoog, Marsch, Mahweide, Krautschicht: Gleiss 1967: 131, Rostock: Müller 1964: 273); Greece (Tsitsipis et al. 2007: 33); Hungary (Kovásci-hegy: Pintera, Szalay-Marzso 1962: 128, Nagycovásci, Kopaszhegy: Szelegiewicz 1968: 15, Ujszenmargita: 1981: 79); Iran (Alborz Region: Lashgarak, Firuzkuh: Hodjat 1998: 30, Gatch-Sar, Meygoun: MNHN Collection); Ireland (Rossbeigh, Belfast: Carter et al. 1987: 268); Italy (Trentino Alto Abrige Region, Abruzzo Region: Patti, Barbagallo 1998: 398); Kazakhstan (near Uralsk: Smailova 1980: 44); Korea (Suwon, Sosa: Paik 1971: 4, 5); Madeira Island (Pico, Santana: Aguiar, Ilharco 2001: 324, 325); Norway (Østfold, Akershus, Rogaland, Hordaland: Tambs-Lyche, Heie 1994: 72); Poland (Władysławowo, Jastarnia, Dajtki near Olsztyn, Frydrychowo near Bydgoszcz, Poznań, Małyszyn near Gorzów Wielkopolski, Warszawa, Trzebinia, Chrzanów, Katowice, near reserve „Segiet", Częstochowska Highland, Skarżysko--Kamienna, Lublin, Pieprzowe Mts, Sowie Mts, Zawoja, Zakopane: Wieczorek 2006—2007: 22, Dąbrowa Górnicza: Wieczorek 25.06.2009, 14.09.2009, 23.10.2009: UŚ Collection); Portugal (Peniche: Rodrigues et al. 2006: 118); Romania (Cernica: Holman, Pintera 1981: 31); Russia (Moskva: Mordvilko 1948: 207, Ural Mts: Shaposhnikov 1964: 543, 544, Ivanovskaja

1966: 196, Kyzyl, Ulyg-Khemka Steppe, Ubsa-Nyrska Steppe: 1972: 20; Ural Mts., West Siberia-Kuznecky Altay, Kuzedevo: 1977: 238); Serbia (Petrovic 1998: 31); Slovakia (Holman, Pintera 1977: 104); Slovenia (Wurzenpass: Eastop, Tanasijević 1966: 55); Spain (León: Nieto Nafría, Mier Durante 1998: 351—354); Sweden (Landskrona, Åhus, Falstebro, Sandby, Åsa, Halmstad, Alvesta, Mörbylånga, Roma, Visby, Rystad, Fröstad, Ryd, Stenungsund, Örebro, Solna, Stockholm, Uppsala, Sala, Karlskoga, Leksand, Falun, Vansäter, Sundsvall, Frösön, Bastuträsk, Luleå, Porjus, Beddinge: Ossiannilsson 1959: 390); Switzerland (Maran near Arosa, Nyon, Zollikofen: Lampel, Meier 2003: 152); Turkey (Tuatay, Remaudieré 1964: 247, Tatvan, near Bingöl: MNHN Collection); Ukraine (Krym: Bozhko 1957b: 211, Zdeneve, Uklin, Beregove: Mamontova-Solukha 1963: 28, Volinska distr., Povenska distr.: 1964: 62); United Kingdom (Walker 1848: 47, Rothamsted, Guildford, Dawlish, Newton Abbot, Devon, Leeds, Staines, Birmingham district, Blair Atholl: Theobald 1929: 27—29, Hampstead: Wood-Baker 1955: 152, Inveran, loch Moraig, Blair Atholl, Vairn, Dunecht, Nethybridge, St. Coombs: Shaw 1964: 82).
Among the genus *Atheroides* the most common species, widely distributed in Palaearctic as well as introduced into Canada.



Map 6. *A. serrulatus* — geographical distribution

Host Plant: Poaceae — *Agrostis curtisii* Kerguélen, *A. stolonifera* L., *Alopecurus geniculatus* L., *A. pratensis* L., *Ammophila arenaria* (L.) Link, *Arrhenatherum* sp., *Brachypodium retusum* (Pers.) Beauv., *Bromus sterilis* L., *Calamagrostis arundinacea* (L.) Roth, *C. epigejos* (L.) Roth., *Corynephorus canescens* (L.) Beauv, *Cynosurus cristatus* L., *Dactylis glomerata* L., *Deschampsia caespitosa* (L.) Beauv., *D. flexuosa* (L.) Trin., *Festuca lanata* L., *F. ovina* L., *F. pallens* L., *F. pratensis* Huds., *F. pseudovina* Hack. ex Wiesb., *F. rubra* L., *F. trachyphylla* (Hack.) Krajina, *Holcus lanatus* L., *Hordeum murinum* L., *Leymus arenarius* (L.) Hochst., *Lolium perenne* L., *Nardus* sp., *Phalaris arundinacea* L., *Poa angustifolia* L., *P. annua* L., *P. compressa* L., *P. pratensis* L., *P. trivialis* L., *Puccinellia maritima* (Huds.) Parl. Prefers species of grasses with narrow leaves.

Cyperacea — *Carex acuta* L., *C. acutiformis* Ehrh., *C. disticha* Huds., *C. divulsa* Stokes, *C. hirta* L., *C. nigra* (L.) Reichard, *C. ovalis* Good, *C. recta* Boot, *C. vesicaria* L.

Juncacea — *Juncus gerardii* Loisel., *J. inflexus* L.

Life History: The species lives, usually singly, on leaves of various grasses or sedges; attended by ants.

Genus *Caricosipha* Börner, 1939

Caricosipha BÖRNER, 1939: 77.
TYPE-SPECIES: *Caricosipha paniculatae* BÖRNER, 1939: 77; by original designation.

HILLE RIS LAMBERS 1939: 87, 88; MAMONTOVA 1959: 31; SHAPOSHNIKOV 1964: 545; MÜLLER 1969: 63; RICHARDS 1972: 3, 4; STROYAN 1977: 33—34; SZELEGIEWICZ 1977: 92, 1985: 44—45; HEIE 1982: 142—143; NIETO NAFRÍA, MIER DURANTE 1998: 354.

Diagnosis: Among the other representatives of the tribe Siphini the genus *Caricosipha* can be distinguished by head and prothorax fused in apterous forms, eyes placed on distinct lateral extensions of head and rather long antennae with long terminal process.

Apterous viviparous female: Body pear-shaped. Front of head convex. Head about 0.27 mm long and 0.55 mm wide. Head and prothorax fused. Abdominal tergites I—VII fused, sclerotized. Cuticular surface with distinct sculpture. Head and dorsal hairs numerous, pointed, long, erected. Antennae long, 5-segmented about 0.50 times body length, with terminal process long, almost 3.00 times as long as base, with 4 small sense-hairs at its tip. Antennal chaetotaxy well developed, hairs thorn-like, erected. Eyes prominent, placed on constricted lateral extensions of head, ocular tubercles distinct. Rostrum short, reaching to middle coxae, apical segment short and blunt, with 2 accessory hairs. Legs hairy, hairs thorn-like about 0.15 mm long, hind legs 1.15—1.20 mm long. Furcula on mesothorax well developed, dark pigmented, located on a wide, stout base. Spiracles small, round, not distinctly visible. Siphunculi stump-shaped placed on anterior margin of abdominal segment VI. Cauda knobbed. Anal plate slightly emarginate.

Alate viviparous female: Head and prothorax not fused. Antennae 1.15—1.21 mm long. Antennal segment III with oval rhinaria lying in row. Abdominal tergites with large, oval marginal sclerites and fused pleural and spinal sclerites. Fore wings 2.05—2.10 mm long. Pterostigma weak pigmented.

Oviparous female: Hind tibiae weak swollen with about 8—22 8-shaped pseudosensoria in the middle part of tibiae.

Apterous male: Body oval, slender. Antennae about 1.17 mm long, about 0.70 times body length. Antennal segment III with 25—28, segment IV with 13—15 rhinaria. Genitalia well developed, strongly sclerotized, pale.

Caricosipha paniculatae Börner, 1939
(Figs 44—47, 112—115)

Caricosipha paniculatae BÖRNER, 1939: 77.

Diagnosis: See the genus.

Redescription: apterous viviparous female (Fig. 44a): coloration of live specimens: black with pale brownish-yellow legs and antennae (HILLE RIS LAMBERS 1939); pigmentation when mounted: dark with head, antennae, siphunculi and legs dusky; some specimens with paler longitudinal stripe from segment II of thorax to cauda and antennae and legs pale. Body pear-shaped 1.70—2.10 mm long and 0.95—1.17 mm wide, with visible sculpture (rows of short, black spinules). Proportion of thoracic segments I:II:III — 0.15:0.15:0.12. Dorsal chaetotaxy: setae numerous, black, pointed, thorn-like 0.24—0.35 mm long. Head chaetotaxy: pointed, thorn-like hairs 0.30—0.35 mm long on whole surface of head. Antennae (Fig. 44b) reaching to abdominal segment II, 0.50—0.55 times body length. Vb:Va 2.40—3.10; other antennal ratios: Vb:III 0.95—1.00, V:III 1.10—1.50, V:IV 2.00—2.40. Antennal chaetotaxy: segm. I with 1—2 hairs, segm. II with 2 hairs, segm. III with 2—4(5) hairs, segm. IV with 1 hair. Antennal hairs about 0.10 mm long; the longest antennal hair III about 4.50—5.00 times basal articular diameter of this segment. ARS (Fig. 44c) about 0.075 mm long, 0.25—0.28 times antennal segment III and 0.68—0.75 times HT II. Distal part of tibiae with rows of short spinules. First tarsal chaetotaxy 5:5:5; empodial hairs spatulate (Fig. 44d). Siphunculi (Fig. 44e) stump-shaped with surface densely covered with rows of short spinules and distinc flange apically, 0.04—0.07 mm in basal diameter. Cauda (Fig. 44f) about 0.075 mm wide, with 4 hairs 0.10 mm long and 3—4 hairs 0.05 mm long.

Measurements of 1 specimen (in mm): (Poland, Łeba distr. Lębork, 21.06.1970, *Carex paniculata*, leg. H. Szelegiewicz, J. Wagner) body: 1.80, ant.: 0.94, ant. segm. (III—V): 0.28:0.16:(0.11+0.28), ARS: 0.075, HT II: 0.11.

Redescription: alate viviparous female: coloration of live specimens: black (HILLE RIS LAMBERS 1939); pigmentation when mounted: pale brown with frons, antennae, femora, hind legs, siphunculi and dorsal sclerites dusky. Body 1.87—1.91 mm long and about 0.85 mm wide. Abdominal tergites I—VII with oval marginal sclerites, pleural and spinal sclerites as large transverse plates, tergite VIII with fused marginal and pleuro-spinal sclerites (Fig. 45a). Head (Fig. 45b) and dorsal chaetotaxy: hairs shorter (on head 0.12—0.15 mm long, marginal hairs on abdominal tergites I—VI 0.09—0.10 mm long on tergites VII—VIII 0.17—0.20 mm long, across abdominal tergites 0.05—0.075 mm long) and less numerous than in apt. viv. fem. Antennae (Fig. 45c) reaching to abdominal segment I, about 0.60 times body length. Vb:Va 2.58—2.60; other antennal ratios: Vb:III 0.73—0.76, V:III 1.00—1.02, V:IV 2.00—2.15. Antennal chaetotaxy: segm. I with 1—2 hairs, segm. II with 1 hair, segm. III with 3—4 hairs, segm. IV with 1 hair. Antennal hairs about 0.075 mm long, the longest antennal hair III about 3 times basal articular diameter of this segment. Segment III with 15—17, segment IV with 0 rhinaria. Wings typical, media with 2 branches (Fig. 45d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Zwickau, 1935, *Carex paniculata*, leg. C. Börner) body: 1.90, ant.: 1.17, ant. segm. (III—V): 0.36:0.22:(0.12+0.31), ARS: 0.075, HT II: 0.10.

Redescription: oviparous female (Fig. 46a): coloration of live specimens: black with pale brownish-yellow legs and antennae (Hille Ris Lambers 1939); pigmentation when mounted: paler than apt. viv. fem. Body 2.10—2.20 mm long and 0.82—0.92 mm long wide. Abdomen with big, oval marginal sclerites, pleural and spinal ones as transverse, weakly visible plates. Head and dorsal chaetotaxy: setae numerous, erected, thorn-like 0.23—0.30 mm long. Antennae (Fig. 46b) 0.46—0.50 times body length. Vb:Va 2.54—2.70; other antennal ratios: Vb:III 1.12—1.00, V:III 1.37—1.60, V:IV 1.85—2.00. ARS about 0.07 mm long, 0.28—0.30 times antennal segment III and 0.59—0.75 times HT II. Hind tibiae (Fig. 46c) weakly swollen with about 8—22 8-shaped pseudosensoria in middle part of tibiae. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (England, Cambridge, Botanical Garden, 9.10.1950, *C. paniculata*, leg. H.L.G. Stroyan) body: 2.19, ant.: 1.09, ant. segm. (III—V): 0.32:0.19:(0.11+0.32), ARS: 0.07, HT II: 0.11.

Redescription: apterous male (Fig. 47a): coloration of live specimens: black (Hille Ris Lambers 1939); pigmentation when mounted: body dark brown, antennae and legs pale. Body oval 1.52—1.69 mm long and about 0.92 mm wide. Abdomen with dark-pigmented, oval marginal sclerites and small transverse pleural and spinal plates. Head and dorsal chaetotaxy: hairs numerous, longer than in apt. viv. fem. 0.20—0.30 mm long, the longest on abdominal tergites VII—VIII. Antennae long (Fig. 47b), reaching to abdominal segment I, about 0.70 times body length. Vb:Va 2.30—2.40; other antennal ratios: Vb:III 0.90—1.00, V:III 1.10—1.25, V:IV 2.00—2.15. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 1—3 hairs, segm. III with 3—5 hairs, segm. IV with 1—2 hairs. Segment III with 25—28, segment IV with 13—15 rhinaria. ARS about 0.07 mm long, 0.15—0.17 times antennal segment III and 0.63—0.65 times HT II. Genitalia well developed, strongly sclerotized, pale (Fig. 47c).

Measurements of 1 specimen (in mm): (England, Cambridge, 12.10.1950, *C. divulsa*, leg. V.E. Eastop) body: 1.54, ant.: 1.17, ant. segm. (III—V): 0.39:0.21:(0.13+0.30), ARS: 0.07, HT II: 0.11.

Material Examined: Type material: Holotype: Zwickau, 1935, *Carex paniculata*, 4 apt. viv, 2 al. viv., 4 nymph, 6 juv. Deutsch. Entomol. Institut Coll. Carl Börner 9/28 (DEIC).

Other material: 8 apt. viv., 7 ovip, 3 males from Great Britain, 1 male from Spain (BMNH); 4 apt. viv. from Sweden (MZLU); 5 apt. viv., 2 ovip. from Spain (UL); 5 apt. viv. from the Netherlands, 1 apt. viv.; 6 apt. viv. from Poland (ZMPA); 4 ovip. from Denmark (ZMUC).

Geographical Distribution (Map 7): Type locality: Zwickau, Germany. Austria (Börner, Franz 1956: 313); Belgium (Jurbise: Nieto Nafría et al. 1999: 36); Czech Republic (Holman, Pintera 1977: 104); Denmark (Jutland, Zealand: Heie 1982: 142, 143); France (Montpelier: Leclant 1967: 39, Mandon: MNHN Collection); Germany (Hohwachter Bucht/Ostee: Gleiss 1967: 131); Greece (Tsitsipis et al. 2007: 34); Hungary (Hortobágy: Szelegiewicz 1968: 15, Hortobágy National Park: 1981: 79); Italy (Sicilia, Caltagirone: Barbagallo, Stroyan 1980: 30, Sicilia: Roberti 1990—1991: 129, Vigo di Fassa (Trentino-Alto): Barbagallo, Patti 1994: 71, North Italy, Sicilia: Barbagallo et al. 1995: 20); Latvia (Riga: Rupais, Juronis 1984: 83, Riga: Rupais 1989: 70, 71); Lithuania (Irszi, Kaunas: Rupais, Juronis 1984: 83, Rakauskas et al. 1992: 86); the Netherlands (Wageningen, Bennekom, Swalmen, Zwolle: Hille Ris Lambers 1939: 88—90); Norway (Oslo: Ossiannilsson 1962: 41; Oslo: Tambs-Lyche, Heie 1994: 72); Poland (Łeba, Olsztyn, Bydgoszcz, Winna Góra near Września, Poznań, Rosnówko, Warszawa, Kolbuszowa Plateau: Wieczorek 2006—2007: 22); Romania (Holman, Pintera 1981: 31); Russia (Shaposhnikov 1964: 545); Spain (Leon, Salamanca, Soria, Zamora: Nieto Nafría, Mier Durante 1998: 356); Slovakia (Holman, Pintera 1977: 104); Sweden (Lomma, Dalby, Sandby, Roma, Orebro, Djursholm, Osbysjon, Uppsala, Vaksala, Jalla, Ytternas: Ossiannilsson 1959: 392); Ukraine (Mamontova 1959: 68, Krym, Uzhorodsky distr.: 1963: 29); United Kingdom (Kew: Eastop 1965: 396, Edinburgh: Shaw 1964: 75, Kent, Surrey, Berkshire, Bedford, Cambridge, Cumberland, Midlothian: Stroyan 1977: 33—34).
European species distributed from the Black Sea coast to United Kingdom, recorded also from Mediterranean Region.

Host Plant: Cyperaceae — *Carex acuta* L., *C. brevicollis* DC., *C. brizoides* L., *C. cuprina* (I. Sandor ex Heuff.) Nendtv ex A. Kern., *C. distans* L., *C. disticha* Huds., *C. divulsa* Stokes, *C. elongata* L., *C. flava* L., *C. hirta* L., *C. lamprophysa* Sam. ex Nordh., *C. ligerica* J. Gay, *C. muricata* L., *C. otrubae* Podp., *C. ovalis* Good, *C. pachystylis* J. Gay, *C. paniculata* L., *C. remota* L., *C. riparia* Curtis, *C. rostrata* Stokes, *C. sempervirens* Vill., *C. spicata* Hudson, *C. straminea* Willd. ex Schkuhr, *C. vulpina* L., *Schoenoplectus maritimus* (L.) Lye.
Juncaceae — *Juncus effusus* L.

Map 7. *C. paniculatae* — geographical distribution

Life History: The species lives on upperside of the leaves, in very numerous colonies, run about quickly if disturbed (Hille Ris Lambers 1939), in marshy places, very local; not attended by ants.

Genus *Chaetosiphella* Hille Ris Lambers, 1939

Chaetosiphella Hille Ris Lambers, 1939: 84.
Type-Species: *Sipha berlesei* Del Guercio, 1904: 4; by original designation.

Richards 1972: 8; Ivanovskaja 1977: 243; Szelegiewicz 1977: 93, 1985: 49; Heie 1982: 155—156; Nieto Nafría, Mier Durante 1998: 356—357; Qiao, Zhang 2002: 759—760; Wieczorek 2008: 327—340.

Diagnosis: Among the other representatives of the tribe Siphini the genus *Chaetosiphella* can be distinguished by the long rostrum with long, stiletto-shaped apical segment and long hind legs.

Apterous viviparous female: Body elongate, ellipsoidal, pear-shaped or egg-shaped. Front of head convex. Head 0.20—0.30 mm long and 0.25—0.40 mm wide. Head and prothorax not fused (except for *Ch. tshernavini*). Abdominal tergites II—VII fused, sclerotized. Cuticular surface smooth (except for *Ch. tshernavini*). Dorsal hairs pointed, thorn-like placed on wart-like bases which look like perforations of the dark sclerite or with forked, jagged or fan-shaped apices. Head + thorax + abdominal segment I as long as abdominal segments II—VIII. Antennae 5-segmented. 0.23—0.40 times body length, with terminal process as long as base or a bit longer or a bit shorter, with 4 small sense-hairs at its tip. Eyes normal, ocular tubercles distinct. Rostrum long, reaching to or above hind coxae (except for *Ch. stipae* subsp. *setosa*) with apical segment stiletto-shaped, longer than antennal segment III and segment II of hind tarsus, with 2 accessory hairs. Hind legs 1.05—1.85 mm long. Empodial hairs pointed or spatulate. Furcula on mesothorax well developed, dark pigmented, usually located on wide, stout base. Spiracles round, placed on margin of distinct, dark-pigmented spiracular plates. Siphunculi pore-shaped or slightly elevated, placed on anterior margin of abdominal segment V, with surface smooth. Cauda and anal plate broadly rounded.

KEY TO SPECIES OF *CHAETOSIPHELLA* (apterous viviparous female)

1. Dorsal hairs pointed 2
— Dorsal hairs with pointed, forked, jagged or fan-shaped apices 3
2. Body egg-shaped, abdominal tergites with small, dark sclerites. Dorsal hairs not arranged in visible rows. Antennal segment III with 2—4 hairs On various grasses .... *Ch. berlesei* (Del Guercio)
— Body ellipsoidal, abdominal tergites without small, dark sclerites. Dorsal hairs arranged in visible rows, with numerous short hairs. Antennal segment III with 4—6(8) hairs. On *Stipa* sp. .... *Ch. massagetica* Kadyrbekov
3. Head fused with prothorax, dorsum sclerotic with visible sculpture. Dorsal hairs short, fan-shaped. Antennal segment III with 0—1 short hairs. Apical segment of rostrum stiletto-shaped, 0.25 mm long. On *Corynephorus canescens* .... *Ch. tshernavini* (Mordvilko)
— Head not fused with prothorax, dorsum sclerotic without visible sculpture. Dorsal hairs with pointed, forked, jagged or fan-shaped apices 4
4. Marginal hairs forked or jagged, hairs with pointed apices only on margin of abdominal tergites VII and VIII. Antennal segment III with 3—5 hairs. Apical segment of rostrum stiletto-shaped, 0.17—0.22 mm long. On *Stipa* sp. .... *Ch. stipae* Hille Ris Lambers
— Almost all marginal hairs pointed, thorn-like 5
5. Antennal segment III with 4—7 hairs. Apical segment of rostrum stiletto-shaped, short, 0.12—0.15 mm long. On *Stipa* sp., *Achnatherum calamagrostis*, *Calamagrostis arundinacea* .... *Ch. stipae* subsp. *setosa* Wieczorek
— Antennal segment III with 5—7 hairs. Apical segment of rostrum stiletto-shaped, long, 0.26—0.30 mm long. On *Ammophila arenaria* .... *Ch. longirostris* Wieczorek

Alate viviparous female: Antennae longer than 0.50 mm, 0.31—0.47 times body length. Antennal segment III with 3—9 oval rhinaria lying in row in inner margin of this segment. Abdominal tergites I—V with large, oval marginal sclerites, separate small pleural sclerites and spinal sclerites as large transverse plates; tergite VI with oval marginal sclerites and fused pleural and spinal sclerites, tergites VII—VIII with fused marginal, pleural and spinal sclerites. Dorsal sclerites dark pigmented. Fore wings typical, 1.80—2.45 mm long, with normal venation. Media with 3 branches. Pterostigma weak pigmented.

KEY TO SPECIES OF *CHAETOSIPHELLA* (alate viviparous female)

1. Apical segment of rostrum about 0.12 mm long and 0.40—0.50 times antennal segment III .... *Ch. stipae* subsp. *setosa* Wieczorek

— Apical segment of rostrum 0.20—0.27 mm long and 1.40—2.10 times antennal segment III 2
2. Dorsal hairs pointed .... *Ch. berlesei* (Del Guercio)
— Dorsal hairs with pointed, forked, jagged or fan-shaped apices 3
3. Antennal segment III with 0—1 short hairs .... *Ch. tshernavini* (Mordvilko)
— Antennal segment III with 3—5 0.025—0.045 mm long hairs 4
4. Antennal segment III with 3—4 rhinaria. Antennae about 0.30 times body length .... *Ch. longirostris* Wieczorek
— Antennal segment III with 6—9 rhinaria. Antennae about 0.40 times body length .... *Ch. stipae* Hille Ris Lambers

Oviparous female: Abdominal tergites with marginal, pleural and spinal dark-pigmented sclerites. Hind tibiae weak swollen with numerous (18—56) 8-shaped pseudosensoria located on whole surface of tibiae.

KEY TO SPECIES OF *CHAETOSIPHELLA* (oviparous female)

1. Apical segment of rostrum about 0.12—0.14 mm long and 0.62—0.73 times antennal segment III. Hind tibiae with more than 50 pseudosensoria .... *Ch. stipae* subsp. *setosa* Wieczorek
— Apical segment of rostrum 0.19—0.24 mm long and 0.86—1.40 times antennal segment III 2
2. Hind tibiae with less than 45 pseudosensoria. On various grasses .... *Ch. berlesei* (Del Guercio)
— Hind tibiae with more than 45 pseudosensoria. On *Stipa* sp. .... *Ch. stipae* Hille Ris Lambers

Apterous male: Body elongate, slender 1.14—1.43 mm long. Antennae 0.80—0.90 mm long, 0.57—0.65 times body length. Antennal segment III with 28—40, segment IV with 7—22 rhinaria. Genitalia well developed, strongly sclerotized, dark.

KEY TO SPECIES OF *CHAETOSIPHELLA* (male)

1. Apical segment of rostrum about 0.10 mm long, 0.31—0.39 times antennal segment III and 0.71—0.83 times HT II .... *Ch. stipae* subsp. *setosa* Wieczorek
— Apical segment of rostrum 0.15—0.20 mm long, 0.48—0.70 times antennal segment III and 1.00—1.20 times HT II 2
2. Terminal process 0.42—1.10 times base. The longest antennal hair III about 3.00 times basal articular diameter of this segment. Antennal segment IV with 14—22 rhinaria. On various grasses .... *Ch. berlesei* (Del Guercio)

— Terminal process 1.75—2.12 times base. The longest antennal hair III about 2.00 times basal articular diameter of this segment. Antennal segment IV with 7—12 rhinaria. On *Stipa* sp. .... *Ch. stipae* Hille Ris Lambers

Chaetosiphella berlesei **(Del Guercio, 1904)**
(Figs 48—51, 116—119)

Sipha berlesei Del Guercio, 1904: 4.

Hille Ris Lambers 1939: 84—86; Mamontova 1959: 33; Richards 1972: 8—10; Ivanovskaja 1977: 244; Szelegiewicz 1977: 94; 1985: 50; Heie 1982: 156—157.

Diagnosis: This species can be distinguished by numerous, thorn-like hairs covering the body.

Redescription: apterous viviparous female (Fig. 48a): coloration of live specimens: dark lead coloured, very slightly pruinose (Hille Ris Lambers 1939); pigmentation when mounted: yellowish with apices of antennae and tarsi dusky. Body egg-shaped 1.68—1.95 mm long and about 0.95 mm wide. Head about 0.22 mm long and 0.30 mm wide. Abdominal tergites sclerotized, with small, dark sclerites, without visible sculpture. Proportion of thoracic segments I:II:III — 0.22:0.12:0.15. Dorsal chaetotaxy: setae numerous, on abdomen not arranged in visible rows, thorn-like 0.12—0.18 mm long and 0.04—0.06 mm long (Fig. 48b). Head chaetotaxy: 5—6 pointed, thorn-like hairs about 0.15 mm long on apex of head, below shorter, spiny hairs about 0.04 mm long. Antennae (Fig. 48c) reaching to posterior margin of prothorax, about 0.23—0.28 times body length. Vb:Va 0.90—1.10; other antennal ratios: Vb:III 0.47—0.50, V:III 0.95—1.00, V:IV 2.10—2.60. Antennal chaetotaxy: segm. I with 3—4 hairs, segm. II with 1—2 hairs, segm. III with 4 hairs, segm. IV with 1—2 hairs, Va with 1 hair. Antennal hairs pointed, about 0.05—0.07 mm long; the longest antennal hair III about 3.00 times basal articular diameter of this segment. ARS (Fig. 48d) stiletto-shaped, about 0.18—0.20 mm long, 1.10—1.80 times antennal segment III and 1.40—1.60 times HT II. Hind legs about 1.07 mm long; first tarsal chaetotaxy 4:4:4 or 5:5:5; empodial hairs pointed (Fig. 48e). Siphunculi slightly elevated, about 0.03 mm in basal diameter. Cauda about 0.12 mm wide, with 2 hairs 0.10—0.12 mm long and 4 hairs 0.05—0.075 mm long.

Measurements of 1 specimen (in mm): (Poland, Dajtki distr. Olsztyn, 6.09.1966, *Festuca rubra*, leg. H. Szelegiewicz) body: 1.69, ant.: 0.47, ant. segm. (III—V): 0.14:0.07:(0.08+0.07), ARS: 0.20, HT II: 0.11.

Redescription: alate viviparous female: coloration of live specimens: dark lead coloured, very slightly pruinose (Hille Ris Lambers 1939); pigmentation when mounted: pale, antennae, femora, tarsi and dorsal sclerites dusky. Body 1.60—1.62 mm long and about 0.62 mm wide. Abdominal tergites I—VI with large, oval marginal sclerites, tergites I—V with small, oval pleural ones, tergites III—V with spinal ones as large transverse plates. Tergite VI with spinopleural plate; tergites VII—VIII with fused marginal, pleural and spinal sclerites (Fig. 49a). Head (Fig. 49b) with numerous, thorn-like hairs 0.08—0.12 mm long. Antennae (Fig. 49c) reaching to middle of prothorax, about 0.38 times body length. Vb almost as long as Va; other antennal ratios: Vb:III 0.36—0.41, V:III 0.83—0.86, V:IV 1.60—1.90. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 3—5 hairs, segm. IV with 1—2 hairs. Antennal hairs about 0.045—0.05 mm long; the longest antennal hair III about 2.5 times basal articular diameter of this segment. Segment III with 3—4(5), segment IV with 0—1 rhinaria. ARS 0.20—0.24 mm long, 0.80—0.90 times antennal segment III and 1.50 times HT II. Siphunculi short, stump-shaped, about 0.02 mm in basal diameter. Fore wings typical (Fig. 49d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Holland, Bennekom, 24.06.1952, *Corynephorus canescens*, leg. V.E. Eastop) body: 1.62, ant.: 0.62, ant. segm. (III—V): 0.22:0.10:(0.11+0.08), ARS: 0.20, HT II: 0.14.

Redescription: oviparous female (Fig. 50a): coloration of live specimens: dark lead coloured, very slightly pruinose (Hille Ris Lambers 1939); pigmentation when mounted: pale, apices of antennae dusky. Body 1.65—2.1 mm long and 0.86—0.90 mm wide. Abdominal tergites I—VI with oval marginal and pleural sclerites, spinal ones as transverse plates; tergite VII with fused pleural and spinal sclerites; tergite VIII with fused marginal, pleural and spinal sclerites. Head and dorsal chaetotaxy: more hairy than in apt. viv. fem. Antennae (Fig. 50b) reaching to anterior margin of prothorax, 0.24—0.30 times body length. Vb:Va 0.93—1.10; other antennal ratios: Vb:III 0.44—0.52, V:III 0.70—0.88, V:IV 1.90—2.00. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 4—6 hairs, segm. IV with 2 hairs, Va with 1 hair. ARS 0.19—0.24 mm long, 0.86—1.40 times antennal segment III and 1.35—1.70 times HT II. Hind tibiae (Fig. 50c) weak swollen with about 18—44 8-shaped pseudosensoria. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (France, Aiguines, 16.10.1959, *Carex*, leg. V.d. Bosch) body: 2.1, ant.: 0.52, ant. segm. (III—V): 0.17:0.075:(0.08+0.075), ARS: 0.24, HT II: 0.14.

Redescription: apterous male (Fig. 51a): coloration of live specimens: very dark to nearly black (Hille Ris Lambers 1939); pigmentation when mounted: pale. Body elongate, slender 1.30—1.43 mm long and about 0.55 mm wide. Abdominal tergites with weakly visible sclerites. Dorsal hairs numerous, much longer than in apt. viv. fem. 0.15—0.16 mm long and 0.05—0.07 mm long. Antennae (Fig. 51b) long, reaching to abdominal segment I, about 0.62

times body length. Vb:Va 0.42—1.10; other antennal ratios: Vb:III 0.14—0.16, V:III 0.58—0.81, V:IV 1.10—1.57. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 4—5 hairs, segm. IV with 1—2 hairs, Va with 1 hair. Antennal hairs about 0.075 mm long; the longest antennal hair III about 3.00 times basal articular diameter of this segment. Segment III with 29—40, segment IV with 14—22, Va with 0—3 rhinaria. ARS about 0.20 mm long, 0.50—0.70 times antennal segment III and 1.20 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 51c).

Measurements of 1 specimen (in mm): (Poland, Dajtki distr. Olsztyn, 6.09.1966, *Festuca rubra*, leg. S. Huculak) body: 1.43, ant.: 0.89, ant. segm. (III—V): 0.36:0.19:(0.14+0.06), ARS: 0.20, HT II: 0.15.

Material Examined: No type material traced.
Other material: 3 apt. viv., 1 al. viv. from the Netherlands, 4 apt. viv. from Sweden, 1 ovip. from France (BMNH); 8 apt. viv., 1 al. viv. from France (MNHN); 1 apt. viv. from Sweden (MZLU); 4 apt. viv., 1 ovip., 1 male from the Netherlands (RMNH); 2 apt. viv., 1 male from Poland (ZMPA).

Geographical Distribution (Map 8): Belgium (Wijchmaal: Schouteden 1906: 212, Nieto Nafría et al. 1999: 19); Czech Republic (Holman, Pintera 1977: 104); Denmark (Jutland: Heie 1982: 156, 157); Finland (Helsinki, Tikkurila: Heikinheimo 1966: 1, Albrecht 2007: 7); France (Gironde Cap Ferret: MNHN Collection); Germany (Börner 1952: 55); Hungary (Hortobágy: Szelegiewicz 1977: 94, Ujszentmargita: 1981: 79); Ireland (Fota, Cork: Wood-Baker 1953: 69); Italy (North Italy: Barbagallo et al. 1995: 21); the Netherlands (Hille Ris Lambers 1939: 84—86); Poland (Karwia, Opławiec near Bydgoszcz, Dajtki near Olsztyn, Poznań, Chrzanów, Kolbuszowa Plateau: Wieczorek 2006—2007: 22, 23); Russia (Bozhko 1959: 23, Kulunda, Kluczi: Ivanovskaja 1976: 179, Altay (Yarbalyk), Tuva (Kyzyl): 1977: 244); Slovakia

Map 8. *Ch. berlesei* — geographical distribution

(Holman, Pintera 1977: 104); Sweden (Uddevalla, Orebro, Adolfsberg, Uppsala, Ultuna, Vaksala, Jalla, Norberg, Leksand, Falun, Sundsval, Froson, Skelleftea, Arvidsjaur: Ossiannilsson 1959: 392, Sande: 1962: 41); United Kingdom (Stroyan 1955: 326).
Xerophilous european species known also from few localities in West Siberia (probably the disjunctive distribution is only apparent), usually connected with very arid environment (dune areas), but also collected on sun-heated embankments and slopes.

Host Plant: *Aira caryophyllea* L., *Corynephorus canescens* (L.) Beauv, *Deschampsia caespitosa* (L.) Beauv, *D. flexuosa* (L.) Trin., *Elymus repens* L., *Festuca ovina* L., *F. pallens* Host, *F. rubra* L., *F. trachyphylla* (Hack.) Krajina, *Poa* sp.

Life History: The species lives on upperside of the leaves in small colonies, when disturbed drop off the plant; not attended by ants.

Chaetosiphella longirostris Wieczorek, 2008
(Figs 52, 53, 120, 121)

Chaetosiphella longirostris Wieczorek, 2008: 336—337.

Diagnosis: This species can be distinguished by the big size of the body, the length of antennae and hind legs, dorsal and head chaetotaxy and very long apical segment of rostrum.

Redescription: apterous viviparous female (Fig. 52a): coloration of live specimens: not observed; pigmentation when mounted: light brown, antennal segments III and IV, tibiae, tarsi pale; antennal segments I, II, V, hind legs dusky, or hind legs black. Body elongate, ellipsoidal 2.45—2.62 mm long and 0.82—1.04 mm wide. Head about 0.30 mm long and 0.40 mm wide. Sculpture visible only on cauda. Proportion of thoracic segments I:II:III — 0.35:0.30:0.15. Dorsal chaetotaxy: hairs numerous, not arranged in visible rows. On thorax pointed, thorn-like 0.075—0.10 mm long; only a few hairs with forked apices 0.05 mm long. Marginal hairs on tergites I—V 0.10—0.11 mm long, on tergites VI—VIII 0.12—0.15 mm long; almost all marginal hairs pointed, thorn-like (Fig. 52b, c); only few, short hairs with forked apices 0.05 mm long (Fig. 52d). Across abdominal tergites hairs pointed 0.06—0.10 mm, forked 0.04—0.05 mm and jagged 0.01—0.025 mm long (Fig. 52e,f). Head chaetotaxy: hairs pointed, thorn-like 0.12—0.15 mm long and 0.05—0.075 mm long; on all surface of head. Antennae (Fig. 52g) reaching to anterior margin of mesothorax, 0.24—0.28 times body length. Vb:Va 0.75—1.10; other antennal ratios: Vb:III 0.30—0.40, V:III 0.65—0.83, V:IV 1.45—2.20. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2—3 hairs, segm. III with 5—7 hairs, segm. IV with 2 hairs, Va with 2 hairs — one of them on the inner margin of the base, close to the secondary rhinarium, second opposite to the first one. Antennal hairs pointed, about 0.06 mm long; the longest antennal hair III about 2.00—2.40 times basal articular diameter of this segment. Rostrum long, reaching to hind coxae, with apical segment stiletto-shaped (Fig. 52h), 0.26—0.30 mm long, 1.00—1.38 times antennal segment III and 1.40—1.70 times HT II. Hind legs 1.75—1.85 mm long; first tarsal chaetotaxy 5:5:5; empodial hairs spatulate (Fig. 52i). Siphunculi pore-shaped 0.03 mm in basal diameter. Cauda 0.11—0.15 mm wide, with 4 hairs 0.075—0.10 mm long.

Measurements of 1 specimen (in mm): (Peniche, *Ammophila arenaria*, 22.04.1959, no 79, Holotype) body: 2.62, ant.: 0.73, ant. segm. (III—V): 0.26:0.10:(0.09+0.08), ARS: 0.30, HT II: 0.17.

Description: alate viviparous female: coloration of live specimens: not observed; pigmentation when mounted: dirty yellow with antennal segment V, frons, hind legs and abdominal sclerites dusky. Body about 1.80 mm long and 0.62 mm wide. Abdominal tergites I—VI with large, oval marginal sclerites, tergites I—III with small, oval pleural ones and transverse spinal ones, among them transverse intersegmental plates; tergites IV—V with small, oval pleural sclerites and spinal sclerites as large, transverse plates; tergite VI with fused pleural and spinal sclerites; tergites VII—VIII with fused marginal, pleural and spinal sclerites (Fig. 53a). Sculpture visible only on dorsal sclerites Dorsal chaetotaxy: hairs less numerous than in apt. viv. fem., on margin of thorax and abdominal tergites I—V pointed 0.05—0.075 mm long, only few hairs with forked apices; tergites VI—VIII with thorn-like hairs 0.10—0.15 mm long. Across abdominal tergites pointed and forked hairs 0.04—0.06 mm long. Head (Fig. 53b) with numerous pointed hairs. Antennae (Fig. 53c) reaching to posterior margin of prothorax, about 0.31 times body length. Vb:Va 1.12; other antennal ratios: Vb:III 0.33, V:III 0.62, V:IV 1.70. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 3 hairs, segm. IV with 1—2 hairs. Antennal hairs pointed, about 0.025 mm long; the longest antennal hair III about 1.66 times basal articular diameter of this segment. Segment III with 3—4, segment IV with 0 rhinaria. ARS 0.21 mm long, 0.77 times antennal segment III and 1.40 times HT II. Fore wings typical (Fig. 53d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Portugal, Peniche, 13.07.1989, leg. F. Ilharco) body: 1.80, ant.: 0.57, ant. segm. (III—V): 0.27:0.10:(0.08+0.09), ARS: 0.21, HT II: 0.15.

Sexuales: unknown.

MATERIAL EXAMINED: Type material: Holotype: Peniche, *Ammophila arenari*a, 22.04.1959, 1 apt. viv., no 79 (CAEAN); Paratypes: Peniche, *A. arenaria*, 22.04.1959, 1 apt. viv., no 79 (CAEAN); Portugal, Baleal, *A. arenaria*, 22.04.1959, leg. F. Ilharco, 1 apt. viv., no 79, BM 084—340 (BMNH).

Other material: Portugal, Peniche, *A. arenaria*, 5 apt. viv., 1 al. viv. (CAEAN), 1 apt. viv. (UŚ).

Geographical Distribution (Map 9): Type locality: Baleal, beach near Peniche, about 100 km north of Lisbon, Portugal, found only at its typical locality.

Map 9. *Ch. longirostris* — geographical distribution

Host Plant: *Ammophila arenaria* (L.) Link.

Life History: Unknown.

Chaetosiphella massagetica Kadyrbekov, 2005
(Figs 54, 122)

Chaetosiphella massagetica Kadyrbekov, 2005: 1144—1146.

Diagnosis: This species can be distinguished by long, pointed marginal, pleural and spinal hairs.

Redescription: apterous viviparous female (Fig. 54a): coloration of live specimens: greyish green (Kadyrbekov 2005); pigmentation when mounted: yellowish with antennal segment Va and tarsi dusky. Body elongate, ellipsoidal 1.55—1.92 mm long and 0.75—0.85 mm wide. Head about 0.22 mm long and 0.25 mm wide. Without visible sculpture. Proportion of thoracic segments I:II:III — 0.25:0.27:0.15. Dorsal chaetotaxy: hairs arranged in visible rows, pointed, thorn-like 0.125—0.15 mm long, among them numerous, pointed hairs 0.025—0.06 mm long (Fig. 54b,c). Head chaetotaxy: 3—4 pointed, thorn-like hairs 0.12—0.15 mm long on apex of head and numerous hairs 0.05—0.06 mm long on all surface of head. Antennae (Fig. 54d) reaching to posterior margin of prothorax, 0.24—0.30 times body length. Vb:Va 0.85—1.10; other antennal ratios: Vb:III 0.40—0.045, V:III 0.82—0.90, V:IV 1.93—2.00. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 3—6(8) hairs, segm. IV with 2 hairs, Va with 2 hairs-one of them on the inner margin of the base, close to secondary rhinarium, second opposite to the first one. Antennal hairs pointed, erected about 0.06 mm long; the longest antennal hair III 2.50—3.25 times basal articular diameter of this segment. Rostrum long, reaching to hind coxae, with apical segment stiletto-shaped (Fig. 54e), 0.15—0.17 mm long, 0.85—1.34 times antennal segment III and 1.15—1.60 times HT II. Hind legs 1.75—1.80 mm long; first tarsal chaetotaxy 5:5:5; empodial hairs spatulate (Fig. 54f). Siphunculi pore-shaped, 0.03 mm in basal diameter. Cauda broadly rounded, about 0.10 mm wide, with 4 hairs 0.075—0.12 mm long.

Measurements of 1 specimen (in mm): (N. Kazakhstan, Akmola region, Izobilnoe st., *Stipa* sp., 22.07.1974, leg. N. L. Smailova, no 1781, Paratype) body: 1.92, ant.: 0.49, ant. segm. (III—V): 0.175:0.075:(0.07+0.07), ARS: 0.16, HT II: 0.13.

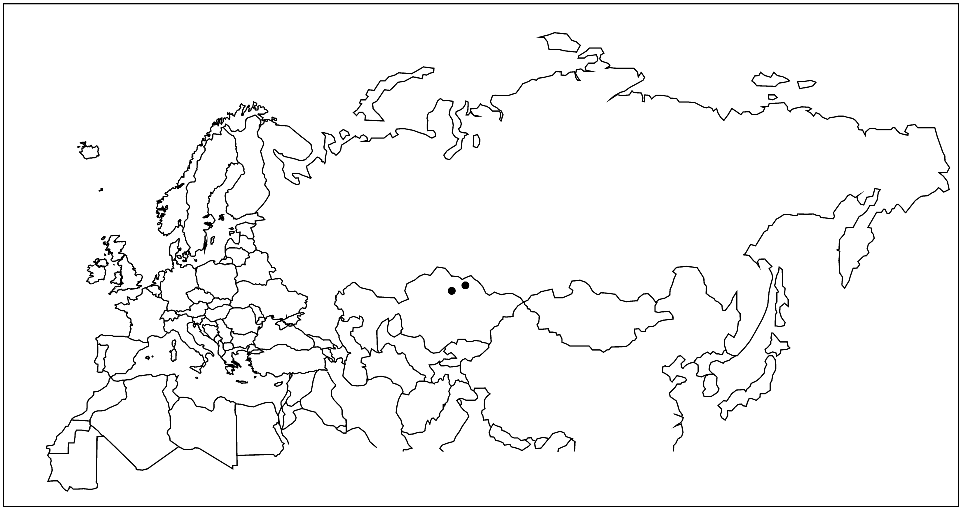
Alate and Sexuales: unknown.

Material Examined: Type material: Paratype: N. Kazakhstan, Akmola region, Izobilnoe st., *Stipa* sp., 22.07.1974, leg. N. L. Smailova, 3 apt. viv., 6 juv., no 1781 (ZMAS).

Geographical Distribution (Map 10): Type locality: Kazakhstan, Kyrgysky Mountain Ridge.

Kazakhstan (Akmola region, Izobilnoe distr., Karagandinska distr., Tshu-Ilinske Mts., Altay Mts. Azutaj Mountain Ridge: Kadyrbekov 2005: 1144).

A very local species found only at few localities in Kazakhstan.



Map 10. *Ch. massagetica* — geographical distribution

Host Plant: *Stipa* sp., *S. capillata* L.

Life History: The species lives on upperside of the leaves in small colonies.

Chaetosiphella stipae Hille Ris Lambers, 1947
(Figs 55—58, 123—126)

Chaitosiphella tshernavini subsp. *stipae* Hille Ris Lambers, 1947: 329—330.

Atheroides stipae Börner, 1950: 44
Chaetosiphella stipifolii Bozhko, 1959: 20—24.
Chaetosiphella pamirica Narzikulov, 1970: 360—361.

Mamontova 1959: 33; Shaposhnikov 1964: 544; Ivanovskaja 1977: 244—245; Szelegiewicz 1977: 94, 1985: 51; Nieto Nafría, Mier Durante 1998: 357; Qiao, Zhang 2002: 760; Wieczorek 2008: 328—332.

Diagnosis: This species can be distinguished by abdominal hairs arranged in visible rows, pointed hairs placed only on head and abdominal tergites VII and VIII as well as hind legs which are long and black.

Redescription: apterous viviparous female (Fig. 55a): coloration of live specimens: black; pigmentation when mounted: dark brown, antennal segments II and III, tibiae, cauda pale, antennal segment Va, tarsi and hind legs black or light brown, antennal segment I, IV and V, femora and hind legs black. Body pear-shaped 1.49—2.09 mm long and 0.72—0.98 mm wide. Head about

0.25 mm long and 0.35 mm wide. Proportion of thoracic segments I:II:III — 0.27:0.20:0.15. Dorsal chaetotaxy: setae numerous, thorax with hairs forked 0.075—0.10 mm long and jagged 0.05—0.075 mm long. Abdominal hairs arrange in 3 rows: marginal hairs on tergites I—VI with forked and jagged apices 0.10—0.12 mm long (Fig. 55b) (specimens from Switzerland, Spain and Iran also with long, pointed hairs), tergites VII and VIII with pointed hairs 0.10—0.15 mm long (Fig. 55c). Pleural and spinal hairs with forked and jagged apices 0.05—0.075 mm long (Fig. 55d); among them numerous, short, fan-shaped hairs 0.025—0.03 mm long (Fig. 55e); tergite VII with longest, forked hairs 0.10—0.12 mm long; tergite VIII with simple, pointed 0.10—0.15 mm long hairs. Head chaetotaxy: hairs pointed, thorn-like, 0.10—0.15 mm long on apex and margin of head; towards to mid of head 2 rows of forked hairs 0.05—0.08 mm long; among them numerous hairs with forked or fan-shaped apices. Antennae (Fig. 55f) reaching to anterior margin of mesothorax, 0.26—0.40 times body length. Vb:Va 0.70—1.60; other antennal ratios: Vb:III 0.35—0.60, V:III 0.64—1.25, V:IV 1.25—2.70. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2—3 hairs, segm. III with 3—5 hairs, segm. IV with 2 hairs, Va with 2 hairs — one of them on inner margin of base, close to secondary rhinarium, second opposite to the first one. Antennal hairs about 0.025—0.05 mm long; the longest antennal hair III about 2.0 times basal articular diameter of this segment. Antennal hairs pointed, sometimes hairs on segments I, II or III with forked apices (specimens from Mongolia and Spain). Rostrum long, reaching to hind coxae with apical segment stiletto-shaped (Fig. 55g), 0.17—0.20 mm long, 0.75—1.58 times antennal segment III and 1.10—1.50 times HT II. Hind legs 1.10—1.24 mm long, black, hairy, some hairs on legs with forked apices; first tarsal chaetotaxy 5:5:5; empodial hairs spatulate (Fig. 55h). Siphunculi pore-shaped 0.025 mm in basal diameter. Cauda 0.10—0.12 mm wide, with 3 hairs 0.08—0.10 mm long.

Measurements of 1 specimen (in mm): (Helvetia, Granches/Sievre, 8.08.1946, *Stipa capillata*, leg. D. Stäger, Lectotype): body: 1.92, ant.: 0.51, ant. segm. (III—V): 0.17:0.07:(0.08+0.06), ARS: 0.20, HT II: 0.15.

Redescription: alate viviparous female: coloration of live specimens: black (SZELEGIEWICZ 1985); pigmentation when mounted: dark brown with femora, tarsi and hind legs black or body pale with hind legs dusky. Body elongate, oval 1.62—1.78 mm long and 0.79—0.82 mm wide. Abdominal tergites I—V with large, oval marginal and pleural sclerites, spinal ones as large transverse plates; tergite VI with large marginal sclerites and fused pleural and spinal sclerites; tergites VII—VIII with fused marginal, pleural and spinal sclerites (Fig. 56a). Head (Fig. 56b) and dorsal chaetotaxy: setae less numerous than in apt. viv. fem, most of them with pointed apices. Antennae (Fig. 56c) reaching to posterior margin of mesothorax, about 0.4 times body length. Vb:Va 1.25—1.50; other antennal ratios: Vb:III 0.35—0.40, V:III 0.64—0.67, V:IV 1.78—1.80. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 1 hair, segm. III with 4—5 hairs, segm. IV with 1 hair, Va wit 1 hair. Antennal hairs pointed, about 0.045 mm long; the longest antennal hair III about 2.25 times basal articular diameter of this segment. Segment III with 5—9, segment IV with 0—1 rhinaria. ARS 0.22—0.27 mm long, 0.80—1.00 times antennal segment III and 1.40—1.70 times HT II. Fore wings typical (Fig. 56d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Mongolia, Zunchara, 3.08.1963, *Stipa capillata*, leg. H. Szelegiewicz) body: 1.62, ant.: 0.62, ant. segm. (III—V): 0.22:0.12:(0.06+0.08), ARS: 0.24, HT II: 0.14.

Description: oviparous female (Fig. 57a): coloration of live specimens: black; pigmentation when mounted: pale brown with paler antennal segments III and IV, tibiae of fore and middle legs, hind legs and abdominal sclerites dark brown. Body elongate 2.05—2.20 mm long and 0.70—0.75 mm wide. Abdominal tergites fused, marginal sclerites big and oval, pleural and spinal sclerites fused into cross bars; among them small, intersegmental plates. Distinct sculpture visible only on abdominal tergites. Dorsal chaetotaxy: hairs with forked apices — marginal ones 0.075—0.12 mm long, pleural ones 0.05—0.075 mm long, spinal ones 0.075—0.10 mm long. Among them numerous hairs with jagged apices 0.01—0.15 mm long. Abdominal tergites VII—VIII with pointed 0.12—0.15 mm long hairs. As in apt. viv. fem. shape of hairs variable — some individuals have more hairs with pointed than forked apices. Head chaetotaxy: hairs numerous, pointed, 0.12—0.125 mm long, among them shorter, blunt hairs 0.06—0.075 mm long and spiny 0.015—0.025 mm long. Antennae (Fig. 57b) reaching middle of prothorax, 0.24—0.25 times body length. Vb:Va 1.00—1.21; other antennal ratios: Vb:III 0.37—0.44, V:III 0.78—0.80, V:IV 1.87—2.30. Antennal chaetotaxy: segm. I with 1—3 hairs (1 with forked apice), segm. II with 2 hairs, segm. III with 4 hairs, segm. IV with 1—2 hairs, Va with 1 hair. The longest antennal hair III about 2.0 times basal articular diameter of this segment. ARS 0.17—0.18 mm long, 0.94—0.97 times antennal segment III and 1.10—1.20 times HT II. Hind legs about 1.39 mm long; hind tibiae (Fig. 57c) slightly thickened with 45—56 8-shaped pseudosensoria. Siphunculi slightly elevated, placed on dark pigmented-plates, about 0.025 mm in basal diameter. Cauda broadly rounded, 0.125 mm wide, with 3 pointed hairs about 0.12 mm long.

Measurements of 1 specimen (in mm): (Owczary, Poland, 9.10.2009, *Stipa capillata*, leg. K. Wieczorek) body: 2.20, ant.: 0.57, ant. segm. (III—V): 0.19:0.08:(0.07+0.085), ARS: 0.18, HT II: 0.15.

Description: apterous male (Fig. 58a): coloration of live specimens: black; pigmentation when mounted: brown, except antennal segment II, proximal part of antennal segment III and tibiae which are pale, genitalia dark or body pale. Body elongate, slender 1.32—1.50 mm long and 0.47—0.50 mm wide. Dorsum with weakly visible sclerites. Dorsal chaetotaxy: setae numerous, thorn-like, abdominal ones arranged in 3 rows 0.09—0.11 mm long, among them shorter hairs about 0.075 mm long; lack hairs with forked, jagged or fan-shaped apices. Head chaetotaxy: hairs pointed 0.10 mm long and 0.04—0.05 mm long.

Antennae (Fig. 58b) long, reaching to abdominal segment I, 0.54—0.58 times body length. Vb:Va 1.75—2.12; other antennal ratios: Vb:III 0.45—0.54, V:III 0.70—0.80, V:IV 1.83—2.08. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 5—6 hairs, segm. IV with 2 hairs, Va with 1 hair. The longest antennal hair III about 2.0 times basal articular diameter of this segment. Segment III with 28—39, segment IV with 7—12 rhinaria. ARS 0.15 mm long, about 0.48 times antennal segment III and as long as HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 58c).

Measurements of 1 specimen (in mm): (Owczary, Poland, 9.10.2009, *Stipa capillata*, leg. K. Wieczorek) body: 1.50, ant.: 0.82, ant. segm. (III—V): 0.31:0.12:(0.08+0.17), ARS: 0.15, HT II: 0.15.

Material Examined: Type material: Lectotype: Helvetia, Granches/Sievre, 8.08.1946, *Stipa capillata*, leg. D. Stäger, 1 apt. viv., Paralectotypes: Helvetia, Granches/Sievre, 8.08.1946, *S. capillata*, leg. D. Stäger, 1 ap.t viv., Helvetia, Sion, 12.05.1947, *S. pennata*, leg. D. Stäger, 2 apt. viv., Helvetia, Sion, 30.07.1947, *S. capillata*, leg. D. Stäger, 6 apt. viv. (BMNH); Helvetia, Granches, 8.08.1946, *S. capillata*, leg. D. Stäger, 2 apt. viv., (RMNH).
Other material: 2 apt. viv. from Austria, 1 apt. viv. from Czech Republic (BMNH); 5 apt. viv. from Spain, 5 apt. viv., 2 al. viv. from Iran, 2 apt. viv. from Turkey (MNHN); 6 apt. viv. from Hungary, 20 apt. viv., 5 al. viv. from Mongolia (ZMPA); 10 apt. viv., 1 al. viv. from Spain (UL); 6 apt. viv., 5 ovip., 4 males from Poland (UŚ).

Geographical Distribution (Map 11): Type locality: Granges near Sievre, Switzerland.
Austria (Leithagebinge: BMNH Collection); China (Hebei (Mt. Xiaowutaishan), Ningxia (Guyuan): Qiao, Zhang 2002: 760); Czech Republic (Rana near Louny: BMNH Collection, Palava Biosphere Reserve: Holman 1995: 193); Germany (Mittelrhein: Börner 1950: 3, 1952: 55); Hungary (Budapest, Nagykovácsi: Szelegiewicz 1968: 15, Zamardi, Fülöphaza: 1977: 93, 94); Iran (Shiraz, near Teheran: MNHN Collection); Italy (Gressan, Val d'Aoste, Laatsch, Vintschgau: Jörg, Lampel 1988: 53, 54, Gressan, Laatsch: 1990: 354, Barbagallo et al. 1995: 21); Kazakhstan (Tarbagatay submountain region: Juchnevisch 1968: 69); Mongolia (near Bornur: Holman, Szelegiewicz 1972: 11); Poland (Pamięcin near Słubice: Achremowicz 1972: 51; Owczary near Słubice: Wieczorek 20.09.2009, 09.10.2009 UŚ Collection); Russia (Athithulac, Groznenska Distr.: Bozhko 1957a: 47, Shaposhnikov 1964: 544, West Siberia-Petropavlovsk, Kulundynski Steppe (Kluci), Altay Mts., Kosh-Agacz, Tashan-Tu: Ivanovskaja 1977: 244, 245); Spain (Avila, Huesca, Zamora, Zaragoza: Nieto Nafrìa, Mier Durante 1998: 357, 358); Switzerland (Sion, Tourbillon, Mont d'Orge, Saillon, Raron, Heidnischbiel, Martigny, La Batiaz, near Branson: Jörg, Lampel 1988: 53, 54, Martigny, Saillon, Mont d'Orge, Sion, Raron: 1990: 354, Lampel, Meier 2003: 151) Tajikistan (Pamir Mts.-Badakhshan District, Valley of the Pjandz river: Narzikulov 1970: 360—362); Turkey (Ümitköy: Özdemir et al. 2005: 98); Ukraine (Kerch Peninsula (Krym): Mamontova 1959: 69).

Xerophilous species connected with temperate steppe zones (e.g. Mongolia, West Siberia, Ukraine, Hungary) or dry mountains' valleys (e.g. West Pamir Mts., Altay Mts., inner Alpine valleys).

Map 11. *Ch. stipae* — geographical distribution

Host Plant: *Achnatherum splendes* (Trin.) Nevsky, *Avena* sp., *Stipa capillata* L., *S. dasyphylla* (Lindem.) Trautv., *S. gigantea* Link, *S. joannis* Celak s.s., *S. kirghisorum* P. Smirn., *S. pennata* L., *S. pennata eriocaulis* (Borbas) Martin.&Skalicky, *S. sareptana* A.K. Becker, *S. sibirica* (L.) Lam., *Trisetum flavescens* (L.) Beauv.; only in Tajikistan, Pamir Mts. (Narzikulov 1970: 361) 2 apterous viviparous females were collected from *Acantholimon pamiricum* Czerniak. (Plumbaginaceae).

Life History: The species lives on steams and upperside of the leaves, attended by ants.

***Chaetosiphella stipae* subsp. *setosa* Wieczorek, 2008**
(Figs 59—62, 127—130)

Chaetosiphella stipae subsp. *setosa* Wieczorek, 2008: 332—336.

Diagnosis: This subspecies can be distinguished from *Ch. stipae* by the length and form of apical segment of rostrum and numerous, pointed hairs on the dorsum.

Redescription: apterous viviparous female (Fig. 59a): coloration of live specimens: not observed; pigmentation when mounted: dark brown, antennal segments I, V, femora, tarsi dark, hind legs black. Body pear-shaped 1.86—2.05 mm long and 0.80—0.85 mm wide. Head about 0.25 mm long and 0.30 mm wide. Proportion of thoracic segments I:II:III — 0.25:0.23:0.15. Dorsal chaetotaxy: setae numerous, not arranged in visible rows. Marginal hairs pointed, 0.10—0.15 mm long (Fig. 59b), only a few hairs with forked apices 0.075 mm long. Across abdominal tergites I—V hairs with forked or jagged apices 0.06—0.08 mm long, among them numerous forked and fan-shaped hairs 0.03—0.04 mm long (Fig. 59c); tergite VI with forked hairs 0.10—0.12 mm long (Fig. 59d); tergites VII—VIII with pointed hairs 0.12—0.15 mm long. Head chaetotaxy: pointed, thorn-like hairs 0.10—0.15 mm long on apex and margin of head; towards to mid of head 2 rows of pointed hairs 0.05—0.06 mm long; a few forked hairs 0.025—0.03 mm long in middle part of head. Antennae (Fig. 59e) reaching to middle of mesothorax, 0.32—0.37 times body length. Vb:Va 1.00—1.50; other antennal ratios: Vb:III 0.30—0.50, V:III 0.66—0.90, V:IV 1.90—2.50. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 5—7 hairs, segm. IV with 2 hairs, Va with 1 hair. Antennal hairs pointed 0.025—0.04 mm long. Antennal hairs III about 2.50 times basal articular diameter of this segment. Rostrum short, reaching to middle coxae with apical segment short, stiletto-shaped (Fig. 59f), 0.12—0.15 mm long, 0.53—0.68 times antennal segment III and 0.83—1.00 times HT II. Hind legs about 1.52 long mm; hairs on legs pointed; first tarsal chaetotaxy 5:5:5; empodial hairs spatulate (Fig. 59g). Siphunculi pore-shaped, 0.02 mm in basal diameter. Cauda about 0.10 mm wide, with 3 pointed hairs 0.05—0.06 mm long.

Measurements of 1 specimen (in mm): (France, M. la Roche de Rame, 1100 m.a.s.l. (H.A.), 22.06.1969, *Calamagrostis argentea*, leg. Rem. at Lecl., Holotype) body: 1.90, ant.: 0.68, ant. segm. (III—V): 0.27:0.09:(0.09+0.09), ARS: 0.15, HT II: 0.16.

Description: alate viviparous female: coloration of live specimens: not observed; pigmentation when mounted: dark with abdomen pale, antennae, femora, tarsi and abdominal sclerites dusky, hind legs black. Body elongate, oval 1.73—1.87 mm long and about 0.58 mm wide. Abdominal tergites I—V with large, oval marginal sclerites, small pleural sclerites and spinal ones as large transverse plates; tergite VI with large marginal sclerites and fused pleural and spinal sclerites; tergites VII—VIII with fused marginal, pleural and spinal sclerites (Fig. 60a). Head (Fig. 60b) and dorsal chaetotaxy like in apt. viv. fem., hairs mostly with pointed apices. Antennae (Fig. 60c) reaching to posterior margin of mesothorax, 0.40—0.47 times body length. Vb:Va 1.30—1.41; other antennal ratios: Vb:III 0.41—0.43, V:III 0.72—0.76, V:IV 1.75—2.00. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 4 hairs, segm. IV with 2 hairs, Va with 1 hair. Antennal hairs pointed, about 0.02 mm long; the longest antennal hair III as long as the basal articular diameter of this segment. Segment III with 5, segment IV with 0 rhinaria. ARS 0.12 mm long, 0.40 times antennal segment III and 0.70—0.80 times HT II. Fore wings typical (Fig. 60d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (France, M. La Roche de Rame, 22.06.1969, *C. argentea*, leg. G. Remaudieré) body: 1.73, ant.: 0.82, ant. segm. (III—V): 0.30:0.11:(0.10+0.13), ARS: 0.12, HT II: 0.17.

Redescription: oviparous female (Fig. 61a): coloration of live specimens: not observed; pigmentation when mounted: pale except for antennal segments I, II, IV and V, femora, tibiae and hind legs which are darker; abdominal sclerites dark. Body elongate 1.62—1.87 mm long and 0.65—0.75 mm wide. Abdominal tergites fused, marginal sclerites small, pleural and spinal ones fused into cross bars; distinct sculpture visible only on sclerites. Dorsal chaetotaxy: hairs less numerous than in apt. viv. fem. Marginal hairs pointed 0.10—0.12 mm long, across abdominal tergites I—V pointed hairs 0.06—0.08 mm long and forked ones 0.025—0.04 mm long. Abdominal tergites VI—VIII with pointed hairs 0.12—0.15 mm long. Head chaetotaxy: hairs numerous, pointed, 0.12—0.15 mm long, among them shorter, spiny hairs 0.04—0.05 mm long. Antennae (Fig. 61b) reaching to prothorax, 0.30—0.35 times body length. Vb:Va 1.00—1.35; other antennal ratios: Vb:III 0.45—0.50, V:III 0.85—0.94, V:IV 2.1—3.20. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 3 hairs, segm. III with 3—5 hairs, segm. IV with 2 hairs, Va with 1 hair. Antennal hairs short; the longest antennal hair III about 2.00 times basal articular diameter of this segment. ARS 0.12—0.14 mm long, 0.62—0.73 times antennal segment III and 0.83—0.89 times HT II. Hind tibiae (Fig. 61c) slightly thickened with 51—53 8-shaped pseudosensoria. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Durance (H.A.), 15.10.1986, *Calamagrostis*, leg. Remaudieré) body: 1.82, ant.: 0.55, ant. segm. (III—V): 0.18:0.075:(0.08+0.08), ARS: 0.12, HT II: 0.14.

Redescription: apterous male (Fig. 62a): coloration of live specimens: not observed; pigmentation when mounted: yellowish, antennal segments III, IV and V, femora, tibiae and genitalia darker. Body elongate, slender 1.14—1.35 mm long and 0.45—0.50 mm wide. Dorsum with weakly visible sclerites. Dorsal chaetotaxy: hairs pointed, marginal ones 0.10—0.15 mm long, across abdominal tergites 0.025—0.075 mm long; less numerous than in apt. viv. fem.; lack hairs with forked, jagged or fan-shaped apices. Head chaetotaxy: hairs pointed 0.10—0.12 mm long and about 0.05 mm long. Antennae (Fig. 62b) long, reaching to abdominal segment I, 0.57—0.65 times body length. Vb:Va 1.70—2.20; other antennal ratios: Vb:III 0.50—0.60, V:III 0.78—0.89, V:IV 2.10—2.80. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 3 hairs, segm. III with 5—7 hairs, segm. IV with 2 hairs, Va with 1 hair. Antennal hairs short. Segment III with 30—33, segment IV with 8—10 rhinaria. ARS about 0.10 mm long, 0.31—0.39 times antennal segment III and 0.71—0.83 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 62c).

Measurements of 1 specimen (in mm): (Durance (H.A.), 15.10.1986, *Calamagrostis*, leg. Remaudieré) body: 1.35, ant.: 0.80, ant. segm. (III—V): 0.32:0.10:(0.08+0.16), ARS: 0.10, HT II: 0.12.

Material Examined: Type material: Holotype: M. la Roche de Raun, 1100 m.a.s.l. (H.A.), 22.06.1969, *Calamagrostis argentea*, leg. Rem. at Lecl., 2 apt. viv.-left, no 4083, Paratypes: M. la Roche de Raun, 1100 m.a.s.l. (H.A.), 22.06.1969, *C. argentea*, leg. Rem. at Lecl., 2 apt. viv.-right, no 4083, La Grave H.A., 25.08.1953, *C. argentea*, leg. Remaudieré, 4 apt. viv., no 4084 MNHN(EH); France, Min. W Canues, 29.03.1959, *Stipa* sp., leg. R. v. d. Bosch, 2 apt. viv., 3 juv., no 1317, BM 1984—340, (BMNH).
Other material: about 30 apt. viv., 5 al. viv., 11 ovip., 8 males from France (MNHN).

Geographical Distribution (Map 12): Type locality: Hautes Alpes, France. France: Caunes-Minervois: BMNH Collection; Hautes Alpes-La Grave, Mount la Roche de Raun, Durance: MNHN Collection, La Grave, l'Argentiere, Lepine (Hautes-Alpes: Leclant 1968: 139).
A very local species known only from few localities in Alpes-Côte d'Azur Provence, France (mostly from Department of Hautes Alpes).

Map 12. *Ch. stipae* subsp. *setosa* — geographical distribution

Host Plant: *Achnatherum calamagrostis* (L.) Beauv., *Calamagrostis arundinacea* L. (Roth), *Stipa* sp.

Life History: Unknown.

Chaetosiphella tshernavini (Mordvilko, 1921)
(Figs 63, 64, 131, 132)

Sipha tshernavini Mordvilko, 1921: 57.

Mamontova 1959: 33; Shaposhnikov 1964: 544; Szelegiewicz 1977: 94—95, 1985: 50—51; Heie 1982: 157.

Diagnosis: This species can be distinguished from the other representatives of the genus by head and prothorax fused, not smooth cuticular surface and very short, not numerous antennal hairs.

Redescription: apterous viviparous female (Fig. 63a): coloration of live specimens: dark green to almost black (Szelegiewicz 1985); pigmentation when mounted: dark yellow with dark brown antennal segment I, apices of antennae and femora. Body elongate, ellipsoidal 1.35—1.82 mm long and about 0.70 mm wide. Head about 0.20 mm long and 0.25 mm wide. Head and prothorax fused. Abdominal tergites with visible, rugose sculpture (Fig. 63b). Proportion of thoracic segments I:II:III — 0.20:0.18:0.10. Dorsal chaetotaxy: setae numerous, about 0.025 mm long, on thorax fan-shaped, on abdomen arranged in 3 rows: marginal hairs with forked and flattened apices (Fig. 63c), on tergites VI—VII about 0.05 mm long, pleural and spinal ones with fan-shaped apices (Fig. 63d); among them numerous, short, fine pointed hairs. Tergite VIII with 6 pointed 0.09—0.11 mm long hairs, among them 2 shorter hairs with flattened apices. Head chaetotaxy: pointed hairs 0.10—0.15 mm long on apex of head; towards to mid of head row fan-shaped hairs about 0.05 mm long; among them numerous hairs with fan-shaped apices 0.025—0.03 mm long. Antennae (Fig. 63e) reaching to posterior margin of prothorax, 0.24—0.28 times body length. Vb almost as long as Va; other antennal ratios: Vb:III 0.38—0.40, V:III 0.80—1.20, V:IV 1.60—2.60. Antennal chaetotaxy: segm. I with 1—2 fan-shaped hairs, segm. II with 1—2 fan-shaped hairs, segm. III with 0—2 pointed hairs, segm. IV with 1 hair. Antennal hairs short. Rostrum long, reaching above hind coxae with apical segment stiletto-shaped (Fig. 63f), about 0.25 mm long, 1.40—2.50 times antennal segment III and 1.60—2.20 times HT II. Hind legs about 1.05 mm long, on legs some hairs with forked and flattened apices; first tarsal chaetotaxy 3:3:3; empodial hairs pointed (Fig. 63g). Siphunculi short, slightly elewated, 0.05 mm in basal diameter. Cauda about 0.075 mm wide, with 2—4 hairs 0.04—0.05 mm long.

Measurements of 1 specimen (in mm): (Czechoslovakia, Kovacov (Sturovo), 31.08.1960, *Festuca* sp., leg. D.H.R.Lambers) body: 1.35, ant.: 0.28, ant. segm. (III—V): 0.1:0.06:(0.005+0.007), ARS: 0.20, HT II: 0.10.

Description: alate viviparous female: coloration of live specimens: not observed; pigmentation when mounted: pale except for antennae and tarsi which are dusky. Body elongate, oval 1.37—1.45 mm long and 0.64 mm wide. Abdominal tergites I—V with large, oval marginal sclerites and separate pleural and spinal sclerites (weakly visible on tergites I—III), among them small intersegmental plates; tergite VI with marginal sclerites and fused pleural and spinal sclerites; tergites VII—VIII with fused marginal, pleural and spinal sclerites (Fig. 64a). Head (Fig. 64b) and dorsal chaetotaxy like in apt. viv. fem. Antennae (Fig. 64c) reaching to anterior margin of mesothorax, 0.36—0.41 times body length. Vb:Va 0.75—1.40; other antennal ratios: Vb:III 0.30—0.47, V:III 0.73—0.80, V:IV 1.80—2.00. Segment III with 6—7, segment IV with 0—1 rhinaria. ARS about 0.21 mm long, about 1.10 times antennal segment III and 2.10 times HT II. Siphunculi short, stump-shaped, about 0.025 mm in basal diameter. Fore wings typical (Fig. 64d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Czechoslovakia, Kovacov (Sturovo), 31.08.1960, *Festuca* sp., leg. D.H.R.Lambers) body: 1.37, ant.: 0.50, ant. segm. (III—V): 0.19:0.07:(0.08+0.06), ARS: 0.21, HT II: 0.10.

Sexuales: unknown.

MATERIAL EXAMINED: No type material traced.
Other material: 2 apt. viv., 1 al. viv., 1 juv. from Czech Republic, 2 apt. viv. from Germany (BMNH); 3 apt. viv., 1 al. viv. from Germany (LFC); 2 apt. viv. from Poland (ZMPA).

GEOGRAPHICAL DISTRIBUTION (Map 13): Czech Republic (Palava Biosphere Reserve: HOLMAN 1995: 193), Germany (Rostock: MÜLLER 1964: 273); Hungary

Map 13. *Ch. tshernavini* — geographical distribution

(Hortobágy National Park: Szelegiewicz 1981: 79); Moldova (Bozhko 1957c: 227); Poland (Olsztyn, Poznań, Dominiczyn, Sosnowica: Wieczorek 2006—2007: 23); Russia (Mordvilko 1921: 57, Groznenska Distr., Stavropolski Kray: Bozhko 1957a: 45, Subcaucasus: 1959: 21, Kulundynski Steppe, Kluczi: Ivanovskaja 1958: 127; Shaposhnikov 1964: 544); Slovakia (Holman, Pintera 1977: 104).
East-European species with a few localities in West Siberia. Probably the disjunctive distribution is only apparent.

Host Plant: *Bromus* sp., *Corynephorus canescens* (L.) Beauv., *Festuca ovina* L., *F. rubra* L., *Stipa capillata* L.

Life History: The species lives on the leaves; attended by ants.

Genus *Laingia* Theobald, 1922

Laingia THEOBALD, 1922: 429.
TYPE SPECIES: *Laingia psammae* THEOBALD, 1922: 429; by original designation.

Anochetium WOOD-BAKER, 1943—1944: 121—142.

MAMONTOVA 1959: 31; NARZIKULOV 1962: 217; SHAPOSHNIKOV 1964: 543; MÜLLER 1969: 63; IVANOVSKAJA 1977: 234; STROYAN 1977: 34—36; SZELEGIEWICZ 1977: 88, 1985: 43; HEIE 1982: 144—145; NIETO NAFRÍA, MIER DURANTE 1998: 359; QIAO, ZHANG 2002: 761.

Diagnosis: Among the other representatives of the tribe Siphini the genus *Laingia* can be distinguished by the elongate body, dorsum partially membranous and siphunculi pore-shaped, placed on anterior margin of abdominal segment VI.

Apterous viviparous female: Body elongate, narrow. Front of head convex to almost flat. Head about 0.25 mm long and 0.37 mm wide. Head and prothorax not fused. Abdominal tergites free, partially membranous with visible intersegmental lines. Cuticular surface with distinct sculpture (rows of short spinules). Head + thorax + abdominal segment I longer than abdominal segments II—VIII. Antennae short, 5-segmented, about 0.25 times body length with terminal process longer than base, with 4 small sense-hairs at its tip. Rostrum short, reaching to middle coxae, apical segment short and blunt, without accessory hairs. Furcula on mesothorax usually weakly developed. Spiracles small, round, not distinctly visible. Hind legs 1.20—1.35 mm long. Siphunculi pore-shaped, placed on anterior margin of abdominal segment VI; surface of siphunculi smooth. Cauda and anal plate broadly rounded.

Alate viviparous female: Antenna 0.72—0.75 mm long, about 0.35 times body length. Antennal segment III with oval rhinaria lying in row in the inner margin of this segment. Abdominal tergites with large, oval marginal sclerites and fused pleural and spinal sclerites. Fore wings very narrow, 2.50—2.60 mm long, with normal venation. Media with 3 branches. Pterostigma weak pigmented, narrow.

Oviparous female: Hind tibiae swallen with about (4—5) 63—67 8-shaped pseudosensoria in the middle part of tibiae.

Apterous male: Body elongate, slender 1.20—1.40 mm long. Antennae about 0.64—0.67 mm long, 0.47—0.53 times body length. Antennal segment III with 20—22, segment IV with 5—9 rhinaria. Genitalia not well developed, weakly sclerotized, pale.

Laingia psammae **Theobald, 1922**
(Figs 65—68, 133—136)

Laingia psammae THEOBALD, 1922: 429—430.

Anochetium nondescriptum WOOD-BAKER, 1943—1944: 140.
Glyphina pilosa DAHL, 1912: 3.

Diagnosis: See the genus.

Redescription: apterous viviparous female (Fig. 65a): coloration of live specimens: dirty yellow to greyish green with brown head; pigmentation when mounted: pale with exception of terminal process which are dusky. Body 1.90—2.70 mm long and about 0.57 mm wide. Head and sclerotized part of thorax and abdomen covered with rows of short spinules (Fig. 65b). Proportion of thoracic segments I:II:III — 0.20:0.175:0.20. Dorsal chaetotaxy: setae numerous, pointed 0.015—0.025 mm long; tergites VII and VIII with longest hairs 0.14—0.22 mm long (Fig. 65c). Head chaetotaxy: 4—6 pointed hairs 0.14—0.22 mm long near frontal margin of head, towards to mid of head 6—8 0.075—0.10 mm long hairs. Antennae (Fig. 65d) reaching to middle of mesothorax, about 0.25 times body length. Vb:Va 1.20—1.55; other antennal ratios: Vb:III 0.50—0.70, V:III 1.10—1.50, V:IV 3.10—4.00. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 2—3 hairs, segm. IV with 1 hair, Va with 2 hairs — one of them on inner margin of base, close to secondary rhinarium, second opposite to the first one. Antennal hairs about 0.02 mm long; the longest antennal hair III about 1.00—1.50 times basal articular diameter of this segment. ARS (Fig. 65e) blunt 0.05—0.06 mm long, 0.28—0.30 times antennal segment III and 0.55—0.68 times HT II. First tarsal chaetotaxy 5:5:5; empodial hairs spatulate (Fig. 65f). Siphunculi pore-shaped, about 0.03 mm in basal diameter. Cauda about 0.085 mm wide, with 5 hairs 0.04—0.06 mm long.

Measurements of 1 specimen (in mm): (Poland, Olsztyn-Kortowo, 10.08.1965, *Calamagrostis epigejos*, leg. H. Szelegiewicz) body: 2.28, ant.: 0.71, ant. segm. (III—V): 0.23:0.09:(0.11+0.17), ARS: 0.07, HT II: 0.14.

Redescription: alate viviparous female: coloration of live specimens: head and thorax dark brown, abdomen green; pigmentation when mounted: pale, front of head, antennae and dorsal sclerites dusky. Body elongate, slender 1.90—2.20 mm long and 0.52—0.55 mm wide. Dorsum partially membranous. Abdominal tergites I—VI with large, oval marginal sclerites and pleural and spinal sclerites fused as large transverse plates; tergites VII—VIII with fused marginal, pleural and spinal sclerites (Fig. 66a). Head (Fig. 66b) and dorsal chaetotaxy like in apt. viv. fem. Antennae (Fig. 66c) reaching to posterior margin of mesothorax, about 0.35 times body length. Vb:Va 1.76—2.00; other antennal ratios: Vb:III 0.85—0.90, V:III 1.31—1.36, V:IV 3.00—4.00. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 2 hairs, segm. IV with 1 hair. Antennal hairs short. Segment III with 2—3, segment IV with 0 rhinaria. ARS 0.075 mm long, 0.34—0.42 times antennal segment III and 0.50—0.60 times HT II. Fore wings long and narrow (Fig. 66d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Poland, Jastarnia, 16.06.1966, *Ammophila arenaria*, leg. H. Szelegiewicz) body: 1.91, ant.: 0.72, ant. segm. (III—V): 0.24:0.08:(0.09+0.17), ARS: 0.05, HT II: 0.13.

Redescription: oviparous female (Fig. 67a): coloration of live specimens: dirty yellow to greyish green with dark brown head; pigmentation when mounted: pale, front of head, apices of antennae, tarsi and cauda dusky. Body elongate, slender 1.90—2.10 mm long and 0.49—0.60 mm wide. Dorsum partially membranous with weakly visible marginal and spinopleural plates, bases of some dorsal hairs with small, sclerotized plates. Antennae (Fig. 67b) reaching to middle of mesothorax, about 0.25 times body length. Vb:Va 1.25—1.30: other antennal ratios: Vb:III 0.70—0.80, V:III 1.30—1.35, V:IV 3.30—3.80. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 2 hairs, segm. IV with 1 hair. ARS 0.05 mm long, 0.33—0.35 times antennal segment III and 0.35—0.40 times HT II. Hind tibiae (Fig. 67c) swollen with about 63—67 (some specimens e.g. from Spain with only 4—5) 8-shaped pseudosensoria in middle part of tibiae. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Denmark, 10.10.1971, *A. arenaria*, leg. O. Heie) body: 1.91, ant.: 0.56, ant. segm. (III—V): 0.14:0.05:(0.08+0.1), ARS: 0.07, HT II: 0.12.

Redescription: apterous male (Fig. 68a): coloration of live specimens: dirty yellow; pigmentation when mounted: yellowish. Body elongate, slender 1.20—1.40 mm long and 0.64—0.67 mm wide. Dorsum partially membranous with weakly visible spinopleural plates on abdominal tergites III—VI. Dorsal chaetotaxy: hairs pointed, fine 0.03—0.05 mm long, arranged in 3 visible rows. Head chaetotaxy: hairs pointed 0.075—0.10 mm long. Antennae (Fig. 68b) long, reaching to abdominal segment II, 0.47—0.53 times body length. Vb:Va 1.50—3.50; other antennal ratios: Vb:III 0.68—0.72, V:III 0.95—1.10, V:IV 2.70—3.50. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 3 hairs, segm. IV with 1 hair, Va with 0—1 hair. Antennal hairs short, the longest antennal hair III as long as basal articular diameter of this segment. Segment III with 20—22, segment IV with 5—9 rhinaria. ARS about 0.07 mm long, 0.27—0.31 times antennal segment III and 0.54—0.58 times HT II. Genitalia not well developed, weakly sclerotized, pale (Fig. 68c).

Measurements of 1 specimen (in mm): (Iran, Lashgarak, Graminee, 23.11.1969, leg. G. Remaudieré) body: 1.40 ant.: 0.67, ant. segm. (III—V): 0.22:0.09:(0.10+0.15), ARS: 0.07, HT II: 0.12.

Material Examined: Type material: Holotype: Kent, Littlestone, 07. 1921, leg. F.V. Theobald, 1 apt. viv. No 3537 (BMNH).
Other material: 1 al. viv., 3 ovip. from Germany, 10 apt. viv., 1 ovip. from Great Britain (BMNH); 3 apt. viv. from Ningxia, China (IOZ, CAS); 2 males from Iran (MNHN); 2 apt. viv., 1 al. viv. from Sweden (MZLU); 3 apt. viv., 1 al. viv. from the Netherlands (RMNH); 2 apt. viv., 2 al. viv., 2 ovip., 2 males from Spain (UL); 2 apt. viv., 2 ovip., 1 male from Poland (UŚ); 3 apt. viv., 1 al. viv. from Poland (ZMPA); 1 apt. viv., 1 al. viv., 1 ovip. from Denmark (ZMUC).

Geographical Distribution (Map 14): Type locality: Littlestone, Kent, United Kingdom.
China (Xinjaing (Yili), Gansu (Yumen), Ningxia (Yinchuan): Qiao, Zhang 2002: 762); Czech Republic (Holman, Pintera 1977: 104); Denmark (Jutland: Heie 1982: 144, 145); Finland (Helsinki, Tikkurila, Mustavuori: Heikinheimo 1966: 1, Nylandia, Savonia australis: Albrecht 2007: 7); France (Banyuls, Foutainebleau: MNHN Collection); Germany (Hille Ris Lambers 1939: 87, Börner 1952: 53, 54, Helgoland: Gleiss 1967: 131); Greece (Tsitsipis et al. 2007: 35); Hungary (Potharasztpuszta: Szelegiewicz 1966: 183); Iran (Caspian area: Gatch-sar, Hadji-abad in Garmsar: Hodjat 1998: 57, near Sananday, Hadji-abad, Lashgarak, Gatch-sar: MNHN Collection); Ireland (Wood-Baker 1943—1944: 140); Italy (Sicilia, Marina di Ragusa, Mt. Etna: Barbagallo, Stroyan 1980: 30, Sicilia: Roberti 1990—1991: 130, Sicilia: Barbagallo et al. 1995: 21); Kazakhstan (Central Kazakhstan: Smailova 1971: 21); Lithuania (Kuronian Spit: Rakauskas et al 2008: 100); the Netherlands (Hille Ris Lambers 1939: 87); Poland (Karwia, vicinity of Krynica Morska, Kalisz Pomorski, Olsztyn, Poznań, Warszawa, Chrzanów, Katowice, Błedowska Desert, Kolbuszowa Plateau, Żywiecka Dale: Wieczorek 2006—2007: 23, Siewierska Góra: Wieczorek 02.06.2008, 09.10.2008, 12.07.2009, 21.10.2009 UŚ Collection); Russia (Pskov, vicinity of Moskva: Narzikulov 1962: 217, 218; West Siberia-Kulundynski Steppe, Kluczi: Ivanovskaja 1958: 127; Subcaucasus: Bozhko 1959: 22, Shaposhnikov 1964: 543; Khabarovsk Territory, Yakutia: Pastshenko 1988: 83); Slovakia (Holman, Pintera 1977: 104); Spain (Pontevedra, Teruel, Zamora Provinces: Nieto Nafría, Mier Durante 1998: 359—362); Sweden (Falstebro, Angelholm, Halmstad, Tofta, Örebro, Uppsala, Medåker, Näverkärret, Taserud, Nåntuna: Ossiannilsson 1959: 389); Tajikistan (Wahska Valley: Narzikulov 1962: 217, 218); Ukraine

(Mamontova 1959: 68, Berehovo: Mamontova-Solucha, 1963: 28, Szaćkyj National Park, Volynska distr: 1964: 62); United Kingdom (Gunwalloe, Hayle (Cornwall): Wood-Baker 1964: 45, Aberdeen: Shaw 1964: 78; Morlich: Stroyan 1976: 252; Winterton Dunes-Norfolk: Wood-Baker, Hopkins 1998: 271).
A common species, widely distributed in Palaearctic.

Map 14. *L. psammae* — geographical distribution

Host Plant: Poaceae — *Agropyron cristatum* (L.) Gaertn., *Agrostis curtisii* Kerguelen, *A. stolonifera* L., *Alopecurus genniculatus* L., *A. pratensis* L., *Ammophila arenaria* (L.) Link., *Arrhenatherum* sp., *Calamagrostis arundinacea* (L.) Roth, *C. epigejos* (L.) Roth, *C. villosa* (Chaix) J.F. Gmel., *Corynephorus canescens* (L.) Beauv., *Dactylis glomerata* L., *Deschampsia caespitosa* (L.) Beauv., *Elymus repens* L., *Glyceria fluitans* L., *Holcus lanatus* L., *Koeleria macrantha* (Ledeb.) Schult, *Leymus arenarius* (L.) Hochst., *L. secalinus* (Georgi) Tzvel, *Panicum* sp., *Phleum pretense* L., *Setaria* sp., *Triticum aestivum* L.
Cyperaceae — *Carex acutifornis* Ehrh.
The main host plant of this species is *C. epigejos*.

Life History: At spring dense colonies of apterous viviparous females (dirty yellow to greyish green with brown head) and juvenils (light green) live on stems, the upperside of leaves or head of grasses. In the middle of the summer colonies on stems and the upperside of leaves are less numerous; the individuals usually live in head of grasses. Alatae viviparous females (with head and thorax dark brown and green abdomen) are rare, occur at the beginning of June. Oviparous females occur in autumn but also have been observed in May (Iran) and June (France, Spain); males occur in October but are very rare. The aphids are sometimes attended by ants.

Genus *Sipha* Passerini, 1860 s. lat.

Sipha PASSERINI, 1860: 29.
TYPE-SPECIES: *Aphis glyceriae* KALTENBACH, 1843: 113; by original designation.

RICHARDS 1972: 98; IVANOVSKAJA 1977: 245; STROYAN 1977: 39—40; SZELEGIEWICZ 1977: 89—90, 1985: 45—46; HEIE 1982: 149—150; FOTTIT, RICHARDS 1993: 622—625; NIETO NAFRÍA, MIER DURANTE 1998: 362—363; QIAO, ZHANG 2002: 762—763.

Diagnosis: Among the other representatives of the tribe Siphini the genus *Sipha* can be distinguished by the body ellipsoidal, or pear-shaped, dorsally flattened and dorsal hairs with pointed apices.

Apterous viviparous female: Body ellipsoidal, oval or pear-shaped, mostly dorsally flattened. Front of head slightly convex to almost flat. Head 0.22—0.35 mm long and 0.30—0.45 mm wide. Head and prothorax not fused, abdominal tergites II—VII fused, sclerotized. Cuticular surface smooth or densely covered with rows of short, robust or minute spinules. Rather hairy with long, thorn-like setae placed on wart-like bases. Eyes normal with distinct ocular tubercles. Antennae medium sized, 5-segmented, 0.22—0.54 times body length, with usually longer terminal process than base and 4 small sense-hairs at its tip. Antennal chaetotaxy well developed (except of *S. (S.) glyceriae* and *S. (S.) littoralis*) — hairs thorn-like, erected. Rostrum short, reaching middle coxae, with apical segment short and blunt, usually with 2 secondary hairs. Hind legs 1.15—1.55 mm long. Empodial hairs pointed. Furcula on mesothorax well developed, located on wide, stout base or with separate arms. Siphunculi placed on abdominal segment V, pore-shaped or slightly elevated, usually surface of siphunculi smooth. Cauda knobbed (subgenus *Sipha* s. str.) or broadly rounded (subgenus *Rungsia*). Anal plate broadly rounded.

KEY TO SUBGENERA OF *SIPHA*

1. Cauda knobbed .... *Sipha* Passerini s. str
2. Cauda broadly rounded .... *Rungsia* Mimeur

Subgenus *Sipha* Passerini, 1860 s. str.

TYPE SPECIES: *Aphis glyceriae* KALTENBACH, 1843: 113; by original designation.

Diagnosis: This subgenus can be distinguished by cauda knobbed.

Apterous viviparous female: Cuticular surface smooth (Nearctic species) or densely covered with rows of short spinules (Palaearctic species). Spiracles round, placed on margin of pale, spiracular plates. Cauda knobbed.

KEY TO SPECIES OF *SIPHA* s. str. (apterous viviparous female)

1. Body densely covered with rows of short, robust spinules 2
— Body not covered with rows of spinules 3
2. Dorsal hairs thorn-like, numerous (0.05) 0.075—0.09 mm long. Antennae 0.60—0.70 mm long, 0.30—0.37 times body length. Antennal segment III with 2—3 pointed hairs .... *S. (S.) glyceriae* (Kaltenbach)
— Dorsal hairs spiny, not numerous 0.01—0.025 mm long. Antennae 0.40—0.46 mm long, 0.23—0.25 times body length. Antennal segment III with 0—1 very short, spiny hair .... *S. (S.) littoralis* (Walker)
3. Dorsal hairs thorn-like, arranged in 3 rows, numerous. Antennae 0.84—1.06 mm long, 0.45—0.54 times body length. On various grasses .... *S. (S.) flava* (Forbes)
— Dorsal hairs thorn-like, not arranged in rows, numerous. Antennae 0.42—0.58 mm long, 0.22—0.27 times body length. On *Agropyron* sp. .... *S. (S.) agropyronensis* (Gillette)

Alate viviparous female: Antennae 0.70—1.18 mm long, about 0.39—0.62 times body length. Antennal segment III with 2—6 oval rhinaria lying in row. Abdominal tergites with small, roundish separate marginal, pleural and spinal sclerites. Fore wings typical 2.60—2.70 mm long, with normal venation. Media with 3 branches. Pterostigma distinctly pigmented.

KEY TO SPECIES OF *SIPHA* s. str. (alate viviparous female)

1. Antennae 1.02—1.18 mm long, about 0.60—0.62 times body length. Cuticular surface smooth .... *S. (S.) flava* (Forbes)
— Antennae shorter than 1.00 mm long, less than 0.50 times body length. 2
2. Apical segment of rostrum about 0.37 times antennal segment III and 0.58 times HT II .... *S. (S.) agropyronensis* (Gillette)
— Apical segment of rostrum 0.25—0.27 times antennal segment III and 0.50 times HT II .... *S. (S.) glyceriae* (Kaltenbach)

Oviparous female: Hind tibiae weakly swallen with numerous (6—42) roundish or irregular shaped pseudosensoria located in middle part of tibiae.

Key to species of *Sipha* s. str. (oviparous female)

1. Cuticular surface smooth. Antennae about 0.43 times body length. Hind tibiae with 12—20 roundish pseudosensoria .... *S. (S.) flava* (Forbes)
— Cuticular surface covered with rows of spinules. Antennae 0.18—0.30 times body length. Hind tibiae with 6—42 roundish or irregular shaped pseudosensoria 2
2. Dorsal hairs thorn-like, numerous. Apical segment of rostrum 0.35—0.40 times antennal segment III and 0.40—0.46 times HT II. Hind tibiae with (14)38—42 roundish pseudosensoria .... *S. (S.) glyceriae* (Kaltenbach)
— Dorsal hairs spiny, not numerous. Apical segment of rostrum 0.53—0.57 times antennal segment III and 0.46—0.70 times HT II. Hind tibiae with 6—15 roundish or irregular shaped pseudosensoria .... *S. (S.) littoralis* (Walker)

Apterous male: Body elongate, slender 1.45—1.85 mm long. Antennae 0.84—1.17 mm long, 0.40—0.58 times body length. Segment III with 30—56, segment IV with 13—20 rhinaria. Genitalia well developed, strongly sclerotized, dark.

Key to species of *Sipha* s. str. (male)

1. Body 1.17—1.20 mm long. Antennae as long as the body. Antennal segment III with 40—56, segment IV with 15—20 rhinaria .... *S. (S.) flava* (Forbes)
— Body 1.45—1.85 mm long. Antennae about 0.50 times body length. Antennal segment III with 30—48, segment IV with 13—15 rhinaria 2
2. Apical segment of rostrum about 0.18 times antennal segment III and 0.40—0.50 times HT II. Antennal segment III with 39—48, segment IV with 13—14 rhinaria .... *S. (S.) glyceriae* (Kaltenbach)
— Apical segment of rostrum 0.22—0.77 times antennal segment III and 0.57—0.60 times HT II. Antennal segment III with 30—32, segment IV with 14—15 rhinaria .... *S. (S.) littoralis* (Walker)

Sipha (Sipha) agropyronensis (Gillette, 1911)
(Figs 69, 70, 137, 138)

Chaitophorus agropyronensis Gillette, 1911: 442—443.

Palmer 1952: 103.

Diagnosis: This species can be distinguished from the other representatives of the subgenus by cuticular surface smooth and numerous dorsal hairs not arranged in rows.

Redescription: apterous viviparous female (Fig. 69a): coloration of live specimens: rusty yellow (Gillette 1911); pigmentation when mounted: yellowish except for apices of antennae, tarsi, femora and cauda which are dusky. Body ellipsoidal 1.82—2.22 mm long and 0.95 mm wide. Head about 0.22 mm long and 0.35 mm wide. Front of head slightly convex. Abdominal tergites with small, transversal intersegmental plates and without sculpture except for abdominal tergite VIII and cauda which are covered by short spinules. Dorsal chaetotaxy: hairs numerous all over dorsum, not arranged in visible rows; on margin of thorax and abdomen 0.10—0.12 mm long, across tergites 0.05—0.08 mm long. Head chaetotaxy: hairs numerous 0.02—0.04 mm long and 0.05—0.08 mm long. Antennae (Fig. 69b) reaching to mesothorax, 0.22—0.27 times body length. Vb:Va 1.00—1.60; other antennal ratios: Vb:III 0.35—0.62, V:III 0.64—0.81, V:IV 1.80—2.20. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 3—4 hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs about 0.025 mm long; the longest antennal hair III as long as basal articular diameter of this segment. ARS (Fig. 69c) 0.11—0.12 mm long, 0.55—0.75 times antennal segment III and 0.73—0.80 times HT II. Furcula usually with separate arms, pale. First tarsal chaetotaxy 4:4:4 (Fig. 69d). Siphunculi pore-shaped, 0.05 mm in basal diameter. Cauda (Fig. 69e) 0.09 mm long, with 2 pointed hairs 0.06—0.08 mm long and 4 fine hairs 0.03—0.04 mm long.

Measurements of 1 specimen (in mm): (United States, Fort Collins, 26.05.1911, leg. L.C. Bragg, Metatype) body: 2.22, ant.: 0.58, ant. segm. (III—V): 0.20:0.07:(0.08+0.07), ARS: 0.11, HT II: 0.15.

Redescription: alate viviparous female: coloration of live specimens: not observed; pigmentation when mounted: yellowish with abdominal sclerites dusky. Body about 1.45 mm long and about 0.58 mm wide. Abdominal tergites I—V with separate, marginal pleural and spinal sclerites, tergite VI with oval marginal sclerites and partially fused pleural and spinal sclerites; tergites VII and VIII with fused marginal, pleural and spinal sclerites (Fig. 70a). Head (Fig. 70b) and dorsal chaetotaxy like in apt. viv. fem. Antennae (Fig. 70c) reaching to posterior margin of mesothorax, 0.48 times body length. Vb:Va 1.30; other antennal ratios: Vb:III 0.37, V:III 0.62, V:IV 1.70. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 1—2 hairs, segm. III with 3 hairs, segm. IV with 1 hair. Antennal hairs about 0.025 mm long; the longest antennal hair III as long as basal articular diameter of this segment. Segment III with 3—5 oval rhinaria lying in middle part of this segment, segment IV with 0 rhinaria. ARS 0.10 mm long, 0.37 times antennal segment III and 0.58 times HT II. Siphunculi short, elevated. Fore wings typical (Fig. 70d). Other characters as in apt. viv. fem.

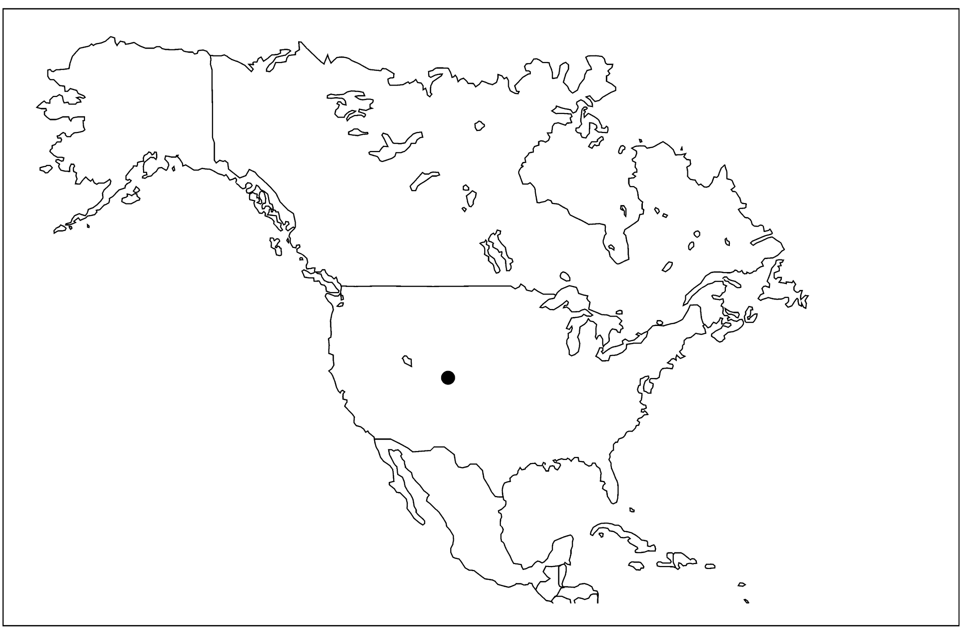
Measurements of 1 specimen (in mm): (United States, Fort Collins, 26.05.1911, leg. L.C. Bragg, Paratype) body: 1.45, ant.: 0.70, ant. segm. (III—V): 0.27:0.10:(0.075+0.10), ARS: 0.10, HT II: 0.17.

Oviparous female: Hind tibiae slightly swollen with about 10—12 pseudosensoria; other characters as in apt. viv. fem. (Palmer 1952).

Male: unknown.

Material examined: Type material: Paratypes: United States, Fort Collins, 26.05.1911, leg. L.C. Bragg, 6 apt. viv., United States, Fort Collins, 26.05.1911, leg. L.C. Bragg, 2 apt. viv., 1 al. viv., 3 juv. (GMBA); Metatypes: United States, Fort Collins, 26.05.1911, leg. L.C. Bragg, 8 apt. viv., 1 al. viv. (GMBA); United States, Fort Collins, 26.05.1911, leg. L.C. Bragg, 2 apt. viv. (BMNH). Other material: 14 apt. viv. from United States (EMUC), (GMBA), (MNHN).

Geographical Distribution (Map 15): Type locality: Fort Collins, Colorado, United States.
United States (Fort Collins, Colorado: Gillette 1911: 442, 443, Boulder, Denver: Palmer 1952: 103, Smith, Parron 1978: 269).
A very local species found only at few localities in United States.



Map 15. *S. (S.) agropyronensis* — geographical distribution

Host Plant: Poaceae — *Agropyron* sp., *Elymus hispidus* (Opiz) Melderis, *E. smithii* (Rydb.) Gould.

Life History: The species lives on upper surface of leaves; attended by ants.

Sipha (Sipha) flava (Forbes, 1884)

(Figs 71—74, 139—141)

Chaitophorus flavus Forbes, 1884: 42.

Sipha carrerai Blanchard, 1939: 16.

Davis 1909: 163—167; Richards 1972: 98—101; Cermeli 1984: 122—123.

Diagnosis: This species can be distinguished by long dorsal hairs arranged in rows and long antennae with long terminal process.

Redescription: apterous viviparous female (Fig. 71a): coloration of live specimens: straw to bright yellow to light green with two double rows of dusky-colored spots down the top of the abdomen and rows of spots along the lateral margin of the abdomen (Nuessly 2008); pigmentation when mounted: yellowish with apices of antennae, tarsi and cauda dusky. Body pear-shaped 1.70—1.95 mm long and 0.89—0.90 mm wide. Head about 0.20 mm long and 0.30 mm wide. Front of head flat. Abdominal tergites without sculpture, with brownish small, transversal intersegmental plates. Dorsal chaetotaxy: setae arranged in 3 rows: marginal ones 0.12—0.15 mm long, pleural and spinal ones 0.08—0.10 mm long, the longest hairs on abdominal tergites VII and VIII. Bases of setae placed on small, dark sclerites. Head chaetotaxy: 2 rows pointed hairs 0.09—0.12 mm long. Antennae (Fig. 71b) reaching to posterior margin of metathorax, 0.45—0.54 times body length. Terminal process long, Vb:Va 1.50—2.20; other antennal ratios: Vb:III 0.92—1.10, V:III 1.36—1.52, V:IV 2.10—2.60. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 3—4 hairs, segm. IV with 1 hair. Antennal hairs 0.05—0.065 mm long; the longest antennal hair III 2.00—3.00 times basal articular diameter of this segment. ARS (Fig. 71c) about 0.05 mm long, 0.18—0.22 times antennal segment III and 0.38—0.41 times HT II. Furcula usually with separate arms. Legs short; first tarsal chaetotaxy 5:5:5 (Fig. 71d). Siphunculi pore-shaped or slighty elevated, spinulose, 0.025 mm in basal diameter. Cauda (Fig. 71e) 0.09 mm long, with 3 pointed hairs 0.08—0.10 long.

Measurements of 1 specimen (in mm): (United States, 10.10.1970, leg. Stewart) body: 1.85, ant.: 0.85, ant. segm. (III—V): 0.24:0.14:(0.12+0.23), ARS: 0.05, HT II: 0.13.

Redescription: alate viviparous female: coloration of live specimens: head and abdomen lemon-yellow, thorax brownish (Davies 1909); pigmentation when mounted: light yellow, apices of antennae, legs, siphunculi, cauda and abdominal sclerites dusky. Body 1.65—1.88 mm long and about 0.98 mm wide. Abdominal tergites with small, oval marginal pleural and spinal sclerites (Fig. 72a), some specimens with spinopleural plates on abdominal tergites VI—VIII. Head (Fig. 72b) and dorsal chaetotaxy: setae pointed, fine, less numerous and shorter (especially hairs on abdominal tergites I—V 0.04—0.05 mm long) than in apt. viv. fem. Antennae (Fig. 72c) long, reaching to abdominal segment II, about 0.60—0.62 times body length. Vb:Va 2.50—2.66; other antennal ratios: Vb:III 0.97—1.18, V:III 1.36—1.66, V:IV 2.64—3.06. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 1—2 hairs, segm. III with 2—3 hairs, segm. IV with 0 hair. Antennal hairs pointed, about 0.02 mm long; the longest antennal hair III as long as the basal articular diameter of this segment. Segment III with 5—6 oval rhinaria lying in row in inner margin of this segment, segm. IV with 0 rhinaria. ARS 0.05 mm long, 0.13—0.18 times antennal segment III and 0.41 times HT II. Siphunculi short, slightly elevated, about 0.025 mm in basal diameter. Fore wings typical (Fig. 72d). Other characters as in apt. viv. fem.

Measurements of 1 specimen: (in mm): (Cuba, Habana, 30.10.1967, leg. J. Holman) body: 1.64, ant.: 1.11, ant. segm. (III—V): 0.32:0.20:(0.13+0.32), ARS: 0.05, HT II: 0.12.

Redescription: oviparous female (Fig. 73a): coloration of live specimens: head, prothorax, mesothorax and tip of abdomen oil-green, abdomen parrot to oil-green (Davies 1909); pigmentation when mounted: dark yellow with darker apices of antennae, legs and siphunculi. Body 1.77 mm long and 0.72 mm wide. Abdominal tergites with very small, oval marginal, pleural and spinal sclerites. Head and dorsal chaetotaxy like in apt. viv. fem. but setae shorter (0.05—0.75 mm long). Antennae (Fig. 73b) reaching to posterior margin of mesothorax, 0.43 times body length. Vb:Va 2.00; other antennal ratios: Vb:III 0.90, V:III 1.36, V:IV 3.00. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 3 hairs, segm. IV with 1 hair. Antennal hairs pointed, about 0.02 mm long. ARS 0.05 mm long, 0.22 times antennal segment III and 0.38 times HT II. Hind tibiae (Fig. 73c) not swollen with about 12—20 roundish pseudosensoria in middle part of tibiae. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Peru, 02.03.1988, *Festuca* sp., leg. Bertschinger) body: 1.77, ant.: 0.77, ant. segm. (III—V): 0.22:0.10:(0.10+0.20), ARS: 0.05, HT II: 0.13.

Redescription: apterous male (Fig. 74a): coloration of live specimens: bright lemon yellow (Davies 1909); pigmentation when mounted: yellowish. Body elongate, slender 1.17—1.20 mm long and 0.52—0.55 mm wide. Abdominal tergites with dark intersegmental plates. Dorsal chaetotaxy: hairs pointed, arranged in marginal, pleural and spinal rows, 0.05—0.10 mm long.

Head chaetotaxy: hairs pointed, about 0.01 mm long. Antennae (Fig. 74b) almost as long as body, 1.03—1.05 times body length. Vb:Va 2.91—3.33; other antennal ratios: Vb:III 0.79—0.88, V:III 1.06—1.15, V:IV 2.35—2.47. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 2 hairs, segm. III with 4—5 hairs, segm. IV with 0—1 hair. Segment III with 40—56, segment IV with 15—20 rhinaria. ARS about 0.05 mm long, 0.11 times antennal segment III and 0.38 times HT II. Genitalia well developed.

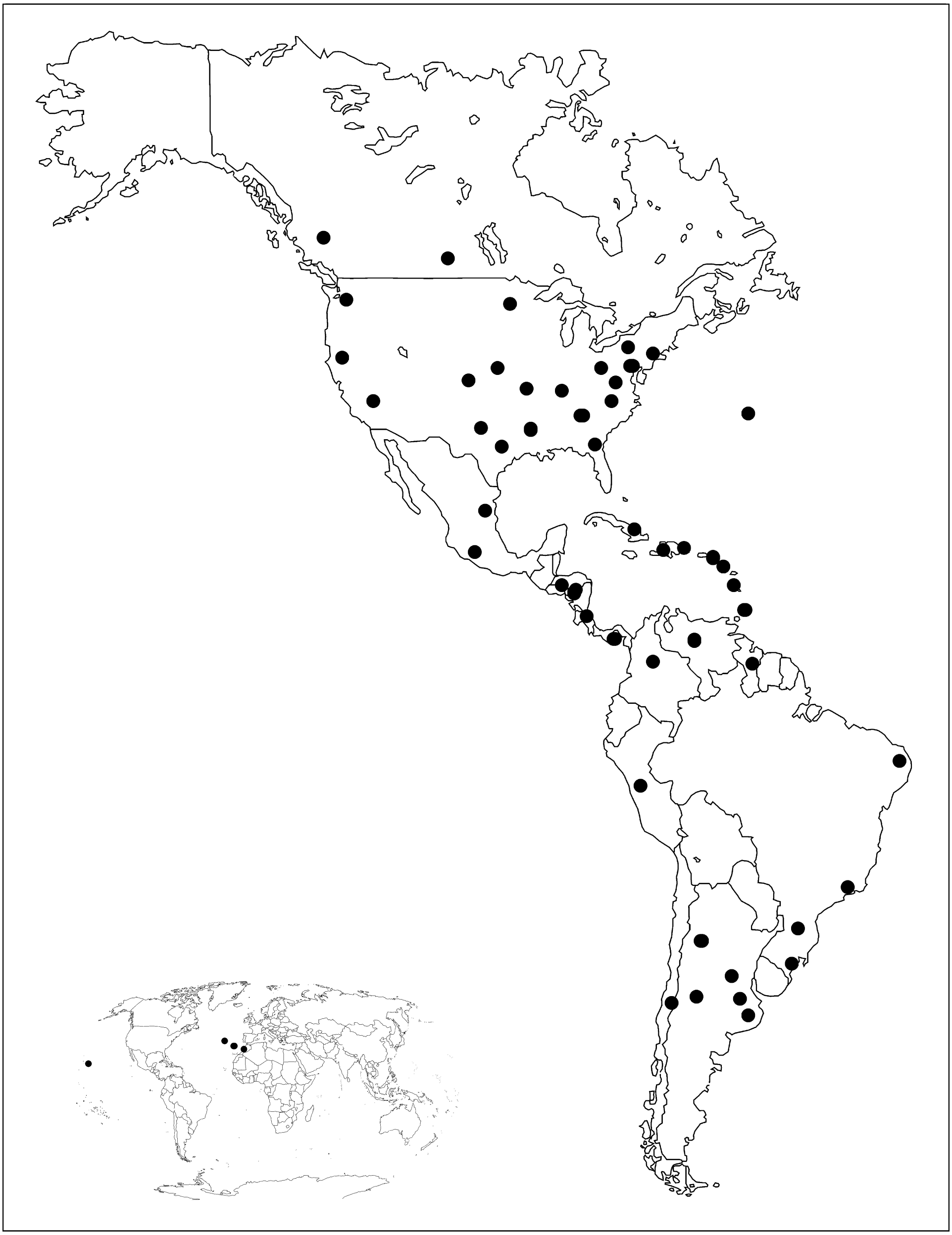
Measurements of 1 specimen (in mm): (USA, Illinois, Neoga, 10.1905, no 504,319 INHS Insect Collection, leg. Davis) body: 1.20, ant.: 1.19, ant. segm. (III—V): 0.45:0.21:(0.12+0.40), ARS: 0.05, HT II: 0.13.

MATERIAL EXAMINED: Type material: Lectotype: United States, Champaign, 25.06.1883, *Sorghum*, 1 al. viv., no 459,581 INHS Insect Collection; Paratypes: United States, Champaign, 25.06.1883, *Sorghum*, 1 apt. viv., 1 juv., no 482,578 INHS Insect Collection, United States, Champaign, 25.06.1883, *Sorghum*, 6 juv., no 482,579 INHS Insect Collection, United States, Champaign, 25.06.1883, *Sorghum*, 1 apt. viv., 1 al. viv., no 482,580 INHS Insect Collection, United States, Champaign, 25.06.1883, *Sorghum*, 3 juv., no 482,581 INHS Insect Collection, United States, Champaign, 25.06.1883, *Sorghum*, 1 apt. viv., no 482,582 INHS Insect Collection, United States, Champaign, 25.06.1883, *Sorghum*, 1 nymph., 3 juv., no 482,583 INHS Insect Collection, Balsam Remount A. Kirst 1987 (INHS).

Other material: 2 males from USA (INHS); 6 apt. viv., 1 al. viv. from USA (LFC); 3 apt. viv., 5 al. viv. from Argentina, 4 apt. viv., 2 al. viv. from Brasil, 1 apt. viv. from Mexico, 5 apt. viv. from Panama, 1 ovip. from Peru (MNHN); 4 apt. viv. from Mexico (MZLU); 2 apt. viv., 1 al. viv. from Cuba (ZMPA); 4 apt. viv. from Cuba (ZMUC).

GEOGRAPHICAL DISTRIBUTION (Map 16): Type locality: Champaign, Illinois, United States.

Argentina (BLANCHARD 1944: 17, SMITH, CERMELI 1979: 60, Buenos Aires, Entre Rios., Mendoza, Santa Fe, Tucuman: NIETO NAFRÍA et al. 1992: 174, 175, Mendoza, Malarqüe: ORTEGO 1997: 71; ORTEGO et al. 2004: 25); Azores (Sao Miguel, Santa Maria: PITA, ILHARCO 1998: 440); Bermuda (SMITH, CERMELI 1979: 60); Brazil (SMITH, CERMELI 1979: 60, STOETZEL, HILBURN 1990: 638, Sao Paulo: SOUSA-SILVA, ILHARCO 1995: 44, 45, Pernambuco, Rio Grande do Sul, Parana: PEREZ HIDALGO et al. 1998: 411); British Guiana (SMITH, CERMELI 1979: 60); Canada (British Columbia, Manitoba: MAW et al. 2000: 29); Chile (Santiago de Chile: GONZALES et al. 1998: 87—89); Colombia (SMITH, CERMELI 1979: 60); Costa Rica (SMITH, CERMELI 1979: 60); Cuba (ALONSO 1968: 2—9, SMITH, CERMELI 1979: 60); Dominican Republic (SMITH, CERMELI 1979: 60); Guadeloupe (SMITH, CERMELI 1979: 60); Haiti (SMITH, CERMELI 1979: 60); the Hawaiian Islands (Maui, Oahu, Kaui, Molokai: KINDLER, DALRYMPLE 1999: 115); Honduras (El Zamorano: EVANS, HALBERT 2007: 523); Madeira (Flores: PITA, ILHARCO 1998: 440); Marocco (ABDELMAJID 2008: 221); Martinique (SMITH, CERMELI 1979: 60); Mexico (Tamaulipas: YANEZ-MORALES,



Map 16. *S. (S.) flava* — geographical distribution

PEÑA-MARTINEZ 1991: 74, Cuernavaca: MNHN Collection); Panama (SMITH, CERMELI 1979: 60); Peru (SMITH, CERMELI 1979: 60, DELFINO 2005: 147); Puerto Rico (El Yunque: SMITH et al., 1971: 220, 221, SMITH, CERMELI 1979: 60, Junin Province, the Andes: MNHN Collection); El Salvador (SMITH, CERMELI 1979: 60); Trinidad (SMITH, CERMELI 1979: 60); United States

(California, District of Columbia, Florida, Georgia, Illinois, Indiana, Kansas, Louisiana, Maryland, Minnesota, Missouri, New Jersey, New York, North California, Oklahoma, Pennsylvania, South Carolina, Texas, Utah, Virginia, Washington: SMITH, PARRON 1978: 269); Venezuela (SMITH, CERMELI 1979: 60, CERMELI 1984: 122, 123).

Nearctic species, widely distributed in United States and Canada (British Columbia and Manitoba) as well as introduced into Central and South America, Hawaiian Islands, Azores, Madeira and Marocco.

HOST PLANT: Poaceae — *Andropogon annulatus* Forsk., *A. caricosus* L., *Axonopus* sp., *Avena sativa* L., *Bouteloua americana* (L.) Scribn., *Brachiaria* sp., *Brachypodium phoenicoides* (L.) Roem.&Schult., *Bromus biebersteinii* Roem.&Schult., *B. marginatus* Nees ex Steud, *Bromus* sp., *Cenchrus brownii* Roem.&Schult., *C. pauciflorus* Benth., *Chloris* sp., *Cortaderia* sp., *Cymbopogon citratus* (DC. ex Nees) Staph., *Cynodon dactylon* (L.) Pers., *Dactylis glomerata* L., *Danthonia* sp., *Digitaria decumbens* Stent, *D. sanguinalis* (L.) Scop, *D. smutsii* Stent, *Echinochloa crus galli* (L.) Beauv., *E. frumentacea* (Roxb.) Link., *Eleusine* sp., *Eragrostis* sp., *Eriochloa punctata* (L.) Desv. ex Ham., *Eulalia* sp., *Festuca* sp., *Holcus* sp., *Hordeum vulgare* L., *Hyparrhenia* sp., *Lolium* sp., *Melinis* sp., *Miscanthus sinensis* Anderss., *Oryza sativa* L., *Panicum fasciculatum* SW., *P. maximum* Jacq., *Paspalum conjugatum* Berg., *P. dilatatum* Poir., *P. melanospermum* Desv. ex Poir., *P. paniculatum* L., *Pennisteum cladestinum* Hochst. ex Chiov., *P. ciliare* (L.) Link., *P. orientale* L.C. Rich, *P. purpureum* Schumach., *Phalaris* sp., *Phleum pratense* L., *Poa pratensis* L., *Rhynchelthrum* sp., *Saccharum officinarum* L., *Setaria geniculata* (Lam.) Beauv., *S. italica* (L.) Beauv., *S. pumila* (Poir.) Roem.&Schult., *S. sphacelata* (Schumach) Moss, *S. vericillata* (L.) Beauv., *Sorghastrum* sp., *Sorghum bicolour* (L.) Moench, *S. halepense* (L.) Pers., *S. vulgare* Pers., *Sporobolus indicus* (L.) R. Br., *Stenotaphrum secundatum* (Walt.) Kuntze, *Tricholaena* sp., *Triticum aestivum* L., *Zea mays* L.
Cyperaceae — *Carex* sp., *Cyperus* sp.

LIFE HISTORY: Monoecious and holocyclic in areas with cold winters, anholocyclic in warm climates. Occur in large colonies on upperside of leafs; not visited by ants.

COMMON NAME: yellow sugarcane aphid.

NOTES: A vector of sugar cane mosaic virus.

Sipha (Sipha) glyceriae (Kaltenbach, 1843)
(Figs 75—78, 142—145)

Aphis glyceriae Kaltenbach, 1843: 113.

Sipha schoutedeni Del Guercio, 1900b: 134 (ex Schouteden, 1900).
Sipha glyceriae var. *italica* Del Guercio, 1905: 142—144.

Silvestri 1939: 431; Palmer 1952: 103, 104; Mamontova 1959: 31; Shaposhnikov 1964: 544; Müller 1969: 64; Richards 1972: 101—103; Ivanovskaja 1977: 246; Stroyan 1977: 40—41; Szelegiewicz 1977: 90—91, 1985: 46, 47; Heie 1982: 151—152; Nieto Nafría, Mier Durante 1998: 363.

Diagnosis: This species can be distinguished by cuticular surface covered with rows of short, robust spinules and antennal hairs, short and spiny.

Redescription: apterous viviparous female (Fig. 75a): coloration of live specimens: green to yellowish green (Szelegiewicz 1985); pigmentation when mounted: yellowish except apices of antennae, rostrum, femora and tarsi which are dusky. Body pear-shaped 1.60—2.50 mm long and 0.80—0.92 mm wide, densely covered with rows of short, robust spinules (Fig. 75b). Front of head slightly convex. Head about 0.35 mm long and 0.45 mm wide. Dorsal chaetotaxy: setae not arranged in visible rows, spiny, on margin of thorax and abdominal tergites I—VI 0.075—0.09 mm long, across tergites shorter hairs 0.05—0.075 mm long; on abdominal tergites VII and VIII 0.10—0.125 mm long. Head chaetotaxy: 2 rows of pointed hairs 0.09—0.125 mm long. Some specimens (e.g. from the Netherlands) with much longer 0.10—0.15 setae on head and abdominal tergites. Antennae (Fig. 75c) reaching to posterior margin of mesothorax, 0.30—0.37 times body length. Vb:Va 1.00—1.25; other antennal ratios: Vb:III 0.56—0.71, V:III 1.08—1.25, V:IV 2.16—2.44. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 1—2 hairs, segm. III with 2—3(4) hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs short, spiny; the longest antennal hair III about 1.5 times basal articular diameter of this segment. ARS (Fig. 75d) 0.075—0.10 mm long, 0.40—0.42 times antennal segment III and 0.50—0.57 times HT II. Legs short, hairy; first tarsal chaetotaxy 3:3:3 (Fig. 75e). Furcula located on wide, stout base. Siphunculi slightly elewated, spinulose, 0.05 mm in basal diameter. Cauda (Fig. 75f) 0.125 mm long, with 3 pointed hairs 0.09—0.10 mm long and 2 fine hairs 0.06—0.75 mm long.

Measurements of 1 specimen (in mm): (Poland, Stamirowice, 18.08.1961, *Glyceria fluitans*, leg. Szelegiewicz) body: 1.60, ant.: 0.60, ant. segm. (III—V): 0.175:0.09:(0.10+0.125), ARS: 0.075, HT II: 0.15.

Redescription: alate viviparous female: coloration of live specimens: dark green (Szelegiewicz 1985); pigmentation when mounted: pale, head, apices of antennae, femora, tarsi, siphunculi and abdominal sclerites dusky. Body 2.05—2.15 mm long and 0.68—0.75 mm wide. Abdominal tergites with big, oval marginal sclerites and small, transverse pleural and spinal sclerites (Fig. 76a). Sculpture visible but spinules not as robust as in apt. viv. fem. Head (Fig. 76b) and dorsal chaetotaxy: setae pointed, fine, much numerous and a bit longer than in apt. viv. fem. Antennae (Fig. 76c) reaching to posterior margin of mesothorax, about 0.39 times body length. Vb:Va 1.25—1.30; other antennal ratios: Vb:III 0.50—0.60, V:III 0.90—1.10, V:IV 2.00—2.25. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 2—3 hairs, segm. IV with 1 hair. Antennal hairs about 0.02 mm long; the longest antennal hair III about 1.10 times basal articular diameter of this segment. Segment III with 2—6(8) oval rhinaria lying in the middle part of this segment, segment IV with 0 rhinaria. ARS 0.075 mm long, 0.25—0.27 times antennal segment III and 0.50 times HT II. Siphunculi short, elevated, about 0.05 mm in basal diameter. Fore wings typical (Fig. 76d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Poland, Łupków distr. Sanok, 19.08.1965, leg. J. Wojnarowicz) body: 2.15, ant.: 0.85, ant. segm. (III—V): 0.27:0.15:(0.13+0.17), ARS: 0.075, HT II: 0.15.

Redescription: oviparous female (Fig. 77a): coloration of live specimens: green to yellowish green (Szelegiewicz 1985); pigmentation when mounted: yellowish with darker apices of antennae. Body 1.80—2.48 mm long and 1.22—1.26 mm wide. Dorsum with fused marginal, pleural and spinal sclerites. Antennae (Fig. 77b) 0.26—0.30 times body length. Vb:Va 1.00—1.26; other antennal ratios: Vb:III 0.60—0.73, V:III 1.05—1.46, V:IV 1.66—2.20. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 1 hair, segm. III with 2—3 hairs, segm. IV with 1 hair, Va with 1 hair. Hairs very short. ARS 0.065 mm long, 0.35—0.40 times antennal segment III and 0.40—0.46 times HT II. Hind tibiae (Fig. 77c) weak swollen with about (14)38—42 roundish pseudosensoria in middle part of tibiae. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Tipper Denmark Store, 17.10.1972, leg. O. Heie) body: 1.08, ant.: 0.55, ant. segm. (III—V): 0.15:0.10:(0.11+0.11), ARS: 0.06, HT II: 0.15.

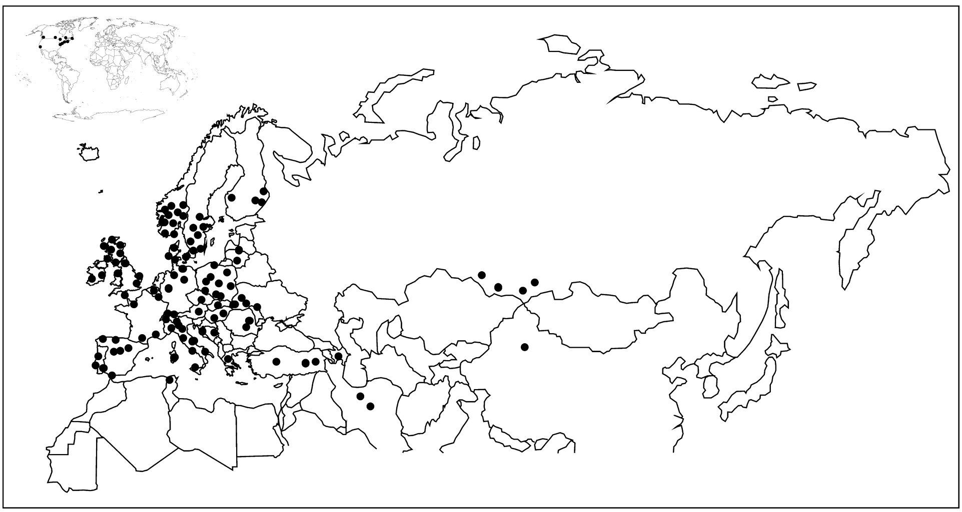
Redescription: apterous male (Fig. 78a): coloration of live specimens: blackish (Szelegiewicz 1985); pigmentation when mounted: dark with femora and tibiae pale. Body oval, slender 1.45—1.85 mm long and 0.75—0.85 mm wide. Dorsal hairs numerous, fine, longer than in apt. viv. fem. Antennae (Fig. 78b) long, reaching to abdominal segment I, about 0.48—0.58 times body length. Vb:Va 1.00—1.54; other antennal ratios: Vb:III 0.37—0.45, V:III 0.73—0.75, V:IV 1.71—1.78. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 1—4 hairs, segm. IV with 0—1 hair. Segment III with 39—48, segment IV with 13—14 rhinaria. ARS about 0.065 mm long, 0.18 times antennal segment III and 0.40—0.50 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 78c).

Measurements of 1 specimen (in mm): (Denmark, Store Tipper, 17.10.1972, leg. O. Heie) body: 1.54, ant.: 1.17, ant. segm. (III—V): 0.39:0.21:(0.13+0.30), ARS: 0.07, HT II: 0.11.

Material examined: No type material traced.
Other material: 16 apt. viv., 5 ovip., 2 males from Great Britain (BMNH); 2 apt. viv., 3 al. viv. from France, 4 apt viv., 1 al. viv. from Turkey (MNHN); 2 apt. viv. from Sweden (MZLU); 4 apt. viv., 1 al. viv., 3 ovip., 3 males from the Netherlands (RMNH); 5 apt. viv., 1 al. viv. from Poland, 4 apt. viv. from Hungary (ZMPA); 5 apt. viv., 1 ovip., 1 male from Denmark (ZMUC).

Geographical Distribution (Map 17): Austria (Hausruck near Hobelschlag: Weis 1955: 476; Börner, Franz 1956: 313); Azerbaijan (Stepanakerta: Rusanova 1942: 43); Belgium (Tervueren, Nieuport: Schouteden 1906: 212, Nieto Nafría et al. 1999: 19, Gembloux: MNHN Collection); Bulgaria (Sofia: Tashev 1964: 161); Canada (British Columbia, Manitoba, Ontario, Quebec, New Brunswick: Maw et al. 2000: 29); China (Xinjiang (Wulumuqi): Qiao, Zhang 2002: 765, 766), Croatia (Gotlin Culjak, Igrc Barcic 2002: 258); Czech Republic (Holman, Pintera 1977: 104; Palava Biosphere Reserve: Holman 1995: 194); Denmark (Heie 1982: 150—152); Finland (Janakkala, Mustasaari, Vikby: Heikinheimo 1966: 1, Albrecht 2007: 7); France (Ur, Banyuls: Remaudieré 1958: 8, 9, Camargue: Leclant 1967: 38, Quineville (Manche): Remaudieré et al. 1980: 350); Germany (Börner 1952: 55, Adolfkoog, Marsch, Mahweide, Hohwachter Bucht/Ostsee: Gleiss 1967: 131); Greece (Tsitsipis et al. 2007: 36); Hungary (Gardony: Pintera, Szalay-Marzso 1962: 128, Nagysásto, Hortobágy: Szelegiewicz 1968: 15); Iran (central part of Iran: Hodjat 1998: 77, Re'zachieh, Lale'zar: MNHN Collection); Ireland (Fota, Cork: Wood-Baker 1953: 68, Fota, Rossbeigh, Rossdohan Island, North Slob: Carter et al. 1987: 269); Italy (Silvestri 1939: 431; Bologna, Piemont, Emilia, Meridione: Martelli 1950: 270; Perugia: Wood-Baker 1953: 68; Lombardia, Toscana, Campania, Sardinia, Sicilia, Calatabiano: Barbagallo, Stroyan 1980: 30, Sicilia: Roberti 1990—1991: 130, North and South Italy, Sicilia, Sardinia: Barbagallo et al. 1995: 21); Latvia (Riga, Priekuli: Von Zirnits 1927: 251; Tukums, Riga: Rupais 1989: 89); Lithuania (Rakauskas et al. 1992: 86); Norway (Tambs-Lyche, Heie 1994: 73); Poland (Władysławowo, vicinity of Krynica Morska, Olsztyn, Bydgoszcz, Poznań, Warszawa, Trzebinia, Lublin, Rzeszów, Sowie Mts., Żywiecka Dale: Wieczorek 2006—2007: 25); Portugal (Coruche, Salvaterra de Magos, Muge: Ilharco 1991—1995: 41); Romania (Cristesti, Holboca: Borcea 1909: 250, Murighiol: Holman, Pintera 1981: 32); Russia (Mordvilko 1929: 87—89, Central Asia: Nevski 1949: 128, West Siberia: Shaposhnikov 1964: 544, Kulundynski Steppe, Kluczi: Ivanovskaja 1958: 128, West Siberia: 1976: 179, Novosibirsk, Novy Sharan: 1977: 246); Serbia (Petrovic 1998: 41); Slovakia (Holman, Pintera 1977: 104); Spain (Cadiz, Cantabria, La Coruna, Leon, Salamanca, Zamora: Nieto Nafría, Mier Durante 1998: 363—365); Sweden (På, Höör: Wahlgren 1955: 1; Lomma, Sandby, Landskrona, Roma, Rystad,

Stenungsund, Djursholm, Vaksala, Jalla, Uppsala, Medaker, Karlskoga, Nytrop: Ossiannilsson 1959: 391); Switzerland (Muttenz: Werder 1931: 25, Riedmatt, Fribourg, Mont d'Amin: Lampel, Meier 2003: 173); Tunisia (Dunes de Tabarca: MNHN Collection); Turkey (Kirsehir, Ahlat, Bitlis, Tatvan-Sükran: Tuatay, Remaudieré 1964: 246); Ukraine (Mamontova 1949: 91, Kanev: 1953: 67, Zakarpatsky distr: 1959: 69, Mukatsevo, Beregove, Uklin: 1963: 29, Pozno: 1964: 62); United Kingdom (Catacol, Putney, Wisley: Laing 1921: 119, Channel Isles: Eastop 1953: 155, Kew: 1962: 145, Invershin, Arran, Edinburgh, Balerna, Roslin, Isles of Canna and Sanday Donmouth, Aberdeen, Nairn, Turrif, R. Nith, Loch Kinnordy near Kirriemur: Shaw 1964: 67, 68, Wenthworth: Wood-Baker 1953: 68; Pörtschach, Hosey: 1964: 45, 46; Loch an Eilen, Dell: Stroyan 1969: 229); United States (Connecticut, Maine, New York, Pennsylvania: Smith, Parron 1978: 270, California: Royalty et al. 1993: 10).
Palaerctic, widely distributed species, also introduced into Canada and United States.



Map 17. *S. (S.) glyceriae* — geographical distribution

Host Plant: Poaceae — *Agropyron* sp., *Agrostis canina* L., *A. capillaris* L., *A. gigantea* Roth, *A. stolonifera* L., *Alopecurus aequalis* Sobol., *A. geniculatus* L., *Ammophila arenaria* (L.) Link, *Arrhenatherum elatius* (L.) Beauv. ex J.&C. Presl, *Calamagrostis epigejos* (L.) Roth, *Catabrosa aquatica* (L.) Beauv., *Dactylis glomerata* L., *Deschampsia cespitosa* (L.) Beauv, *Desmazeria marina* (L.) Druce., *Elymus repens* (L.) Gould, *Festuca brachyphyla* Schult.&Schult., *F. pratensis* Huds., *F. rubra* L., *Glyceria declinata* Bréb., *G. fluitans* (L.) R. Br., *G. maxima* (Hartm.) Holmb., *G. natans* Kom., *G. notata* Chevall., *G. striata* (Lam.) Hitchc., *Holcus mollis* L., *Hordeum brachyantheum* Nevski, *H. jubatum* L., *Hordeum vulgare* L., *Leersia oryzoides*

(L.) Swartz, *Leymus arenarius* (L.) Hochst., *L. racemosus* (Lam.) Tzvelv, *Luziola* sp., *Melica* sp., *Molinia caerulea* (L.) Moench., *Oryza sativa* L., *Paspalum paspalodes* (Michx.) Scribn., *Phalaris arundinacea* L., *Phleum pratense* L., *Phragmites australis* (Cav.) Trin. Ex Steudel, *Poa annua* L., *P. aquatica* L., *P. flabella* (Lam.) Raspail., *P. palustris* L., *P. pratensis* L., *Pucinellia maritima* (Huds.) Parl., *Rorippa sylvestris* (L.) Besser., *Triticum* sp., *Zea mays* L.

Cyperaceae — *Bolboschoenus maritimus* (L.) Palla, *Carex acuta* L., *C. canescens* L., *C. cinerea* (Poll.) Dost., *C. flava* L., *C. gynandra* Schwein., *C. panicea* L., *C. pseudocyperus* L., *C. remota* L., *C. rostrata* Stokes, *Cyperus longus* subsp. *badius* (Desf.) Asch.&Graebn., *C. rotundus* L., *Eleocharis palustris* (L.) Roem.&Schult, *Schoenus nigricans* L.

Juncaceae — *Juncus articulatus* L., *J. conglomeratus* L., *J. effusus* L.

Typhaceae — *Typha latifolia* L.

Alismataceae — *Sagittaria sagittifolia* L.

Life History: The species lives on the underside of leaves and inflorescens of various grasses, sedges or Juncaceae; sometimes attended by ants.

***Sipha (Sipha) littoralis* (Walker, 1848)**
(Figs 79—81, 146—148)

Aphis littoralis Walker, 1848: 44—45.

Laing 1921: 119—120; Mamontova 1959: 31; Stroyan 1977: 41; Heie 1982: 152.

Diagnosis: This species can be distinguished by cuticular surface covered with rows of minute spinules and not numerous, spiny dorsal hairs.

Redescription: apterous viviparous female (Fig. 79a): coloration of live specimens: dark green, rarely pale green (Walker 1848); pigmentation when mounted: yellowish except antennae, legs and cauda which are dusky. Body ellipsoidal 1.70—2.10 mm long and 0.95—1.10 mm wide, covered with rows of minute spinules (Fig. 79b). Head about 0.22 mm long and 0.42 mm wide. Front of head convex. Dorsal chaetotaxy: dorsal hairs not numerous, spiny, 0.01—0.025 mm long, on margin of abdominal tergite VIII pointed hairs 0.05—0.07 mm long. Head chaetotaxy: few fine, pointed hairs 0.02—0.035 mm long. Antennae (Fig. 79c) short, reaching to prothorax, 0.23—0.25 times body lenght. Vb:Va 0.99—1.10; other antennal ratios: Vb:III 0.57—0.60, V:III 1.15—1.36, V:IV 2.50—3.20. Antennal chaetotaxy: segm. I with 0—2 hairs, segm. II with 0—1 hair, segm. III with 0—1 hair, segm. IV with 1 hair opposite the small primary rhinarium, Va with 0—1 hair. Antennal hairs very short; the longest antennal hair III about 0.5 times basal articular diameter of this segment. ARS (Fig. 79d) 0.075—0.09 mm long, 0.62—0.81 times antennal segment III and 0.57—0.69 times HT II. Furcula located on wide, stout base. Legs short; first tarsal chaetotaxy 5:5:5 (Fig. 79e). Siphunculi slighty elevated, spinulose, 0.05 mm in basal diameter. Cauda (Fig. 79f) 0.08 mm long with 2—3 pointed hairs 0.06—0.08 mm long and 2 fine hairs 0.03—0.04 mm long.

Measurements of 1 specimen (in mm): (United Kingdom, Brit.Mus. Walker Coll. Mounted from specimens named *A. littoralis* Walk. In the general colection of B.M. no 514, 24.10.1919, leg. F. Laing, Paratype) body: 2.05, ant.: 0.46, ant. segm. (III—V): 0.13:0.05:(0.075+0.08), ARS: 0.09, HT II: 0.15.

Redescription: oviparous female (Fig. 80a): coloration of live specimens: dark green (WALKER 1848); pigmentation when mounted: pale except for apices of antennae, tarsi and rostrum which are dusky. Body elongate, oval 1.96—2.29 mm long and 0.75—0.95 mm wide. Abdominal tergites with small intersegmental plates. Dorsal chaetotaxy: dorsal hairs not numerous, spiny, on thorax and abdominal tergites I—VI 0.02—0.035 mm long, on abdominal tergites VII and VIII 0.05—0.075 mm long. Head chaetotaxy: 4—6 frontal pointed hairs 0.05—0.06 mm long and 6—8 spiny ones near the frontal margin of head. Antennae (Fig. 80b) reaching to prothorax, 0.18—0.25 times body length. Vb:Va 0.95—1.10; other antennal ratios: Vb:III 0.41—0.57, V:III 1.00—1.10, V:IV 2.20—3.00. Antennal chaetotaxy: segm. I with 1 hair, segm. II with 1 hair, segm. III with 0—2 hairs, segm. IV with 0—1 hair, Va with 0—1 hair. ARS 0.07—0.10 mm long, 0.53—0.75 times antennal segment III and 0.46—0.70 times HT II. Hind tibiae (Fig. 80c) slightly swallen with 6—15 roundish or irregular shaped pseudosensoria in middle part of tibiae.

Measurements of 1 specimen (in mm): (Russia, Murmansk, 21.08.1993, *Juncus* sp. leg. Pzzhiboz) body: 2.10, ant.: 0.54, ant. segm. (III—V): 0.15:0.075:(0.09+0.08), ARS: 0.08, HT II: 0.12.

Redescription: apterous male (Fig. 81a): coloration of live specimens: brown (HEIE 1982); pigmentation when mounted: yellowish, antennae, legs, rostrum, siphunculi, genitalia and dorsal sclerites dusky. Body elongate, slender 1.47—1.63 mm long and 0.55—0.60 mm wide. Abdominal tergites I—IV with small marginal, pleural and spinal sclerites, tergites V—VII with small marginal sclerites and spinopleural plates (visible only in few specimens). Dorsal chaetotaxy: thorax and abdominal tergites I—IV with spiny hairs 0.03—0.045 mm long, tergites V—VIII with pointed hairs 0.05—0.075 mm long. Head chaetotaxy: hairs pointed 0.45—0.075 mm long. Antennae (Fig. 81b) reaching to mesothorax, 0.40—0.51 times body length. Vb:Va 0.85—1.20; other antennal ratios: Vb:III 0.25—0.32, V:III 0.54—0.61, V:IV 0.35—2.10. Antennal chaetotaxy: segm. I with 1 hair, segm. II with 1 hair, segm. III with 3 hairs, segm. IV with 0—1 hair, Va with 0—1 hair. Segment III with 30—32, segment IV with 14—15 rhinaria. ARS 0.07—0.10 mm long, 0.22—0.37 times antennal segment III and 0.57—0.60 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 81c).

Measurements of 1 specimen (in mm): (Russia, Murmansk, 21.08.1993, *Juncus* sp. leg. Pzzhiboz): body: 1.63, ant.: 0.84, ant. segm. (III—V): 0.35:0.14:(0.10+0.09), ARS: 0.08, HT II: 0.14.

Material examined: Type material: Paratypes: 24.10.1919, leg. F. Laing, 2 apt. viv., United Kingdom, Brit.Mus. Walker Coll. mounted from specimens named *A. littoralis* Walk. In the general colection of B.M. no 514, 515 (BMNH).

Other material: 14 apt. viv., 4 ovip., 3 males from United Kingdom (BMNH), (EMUC); 9 apt. viv. from Zoutkamp, the Netherlands (DEIC); 3 ovip., 2 males from Russia (LFC); 7 apt. viv. from France (MNHN); 1 apt. viv. from Sweden (MZLU).

Geographical Distribution (Map 18): Type locality: near Lancaster, United Kingdom.

Map 18. *S. (S.) littoralis* — geographical distribution

Denmark (South Jutland-Højer: HEIE 1982: 152); France (Quineville, Manche: MNHN Collection); Germany (northwest Germany: BÖRNER 1952: 54); Ireland (Cork: WOOD-BAKER 1953: 68, Cork: CARTER et al. 1987: 269); Lithuania (Jurbarkas: JURONIS 1984: 14, RAKAUSKAS et al. 1992: 86); the Netherlands (HILLE RIS LAMBERS 1939: 82, Zoutkamp: DEIC Collection); Russia (Murmansk: LFC Collection); Sweden (Norrbotten-Luleå, Brändön: OSSIANNILSSON 1969: 29); United Kingdom (Burton Pont, Cheschire, Hinksey, Berks: THEOBALD 1929: 8, St. Cyrus, Stornoway, Nairn, Lochboisdale, South Uist, Inverness: SHAW 1964: 72, Wales, Convy: BMNH Collection).
Halophilous species occurs on coastal saltings (e.g. the North Sea coast), however in Lithuania have not been collected in its typical habitat (JURONIS 1984).

HOST PLANT: Poaceae — *Ammophila arenaria* (L.) Link, *Calamagrostis epigejos* (L.) Roth, *Festuca rubra* L., *Puccinellia maritima* (Huds.) Parl., *Spartina maritima* (Curt.) Fern., *S. townsendii* H.&J. Groves.

LIFE HISTORY: The aphids live in the leaf sheaths (HEIE 1982), sexuales occur in October, however in Russia, Murmansk this generation also has been collected in August.

Subgenus *Rungsia* Mimeur, 1933

Rungsia MIMEUR, 1933: 104.
TYPE SPECIES: *Rungsia graminis* Mimeur, 1933; by original designation; junior synonym of *Sipha maydis* Passerini, 1860.

Siphonella BÖRNER, 1939: 77.

NARZIKULOV 1962: 218; IVANOVSKAJA 1977: 238—239; SZELEGIEWICZ 1985: 47; NIETO NAFRÍA, MIER DURANTE 1998: 365—366.

Diagnosis: This subgenus can be distinguished by cauda rounded.

Apterous viviparous female: Cuticular surface usually smooth, rarely covered with rows of short spinules visible only on abdominal tergites VI—VIII. Spiracles round, usually placed on margin of distinct, dark-pigmented spiracular plates. Cauda broadly rounded.

Key to species of *Rungsia* (apterous viviparous female)

1. Dorsal cuticle of abdominal tergites VI—VIII with very short, fine spinules arranged in parallel rows 2
— Dorsal cuticle smooth 3
2. Antennae 0.34—0.37 times body length. Coloration of live specimens: yellow with greenish longitudinal stripes, dull; coloration when mounted: yellowish .... *S. (R.) arenarii* Mordvilko
— Antennae 0.41—0.53 times body length. Coloration of live specimens: brown to black, shining; coloration when mounted: brown to dark brown .... *S. (R.) maydis* Passerini
3. Apical segment of rostrum as long as its basal width 4
— Apical segment of rostrum longer than its basal width 5
4. Apical segment of rostrum 0.06—0.075 mm long, 0.24—0.30 times antennal segment III and 0.46—0.50 times HT II, without secondary hairs .... *S. (R.) elegans* Del Guercio
— Apical segment of rostrum about 0.10 mm long, 0.37—0.43 times antennal segment III and 0.55—0.58 times HT II, with 2 secondary hairs .... *S. (R.) taurica* (Mamontova)
5. Apical segment of rostrum 0.50—0.51 times antennal segment III and 0.73—0.77 times HT II. Antennal segment III with 7 hairs. On *Leymus chinensis* .... *S. (R.) burakowskii* Szelegiewicz, Holman
— Apical segment of rostrum 0.28—0.37 times antennal segment III and 0.43—0.50 times HT II. Antennal segment III with 3—4 hairs. On *Carex praecox* .... *S. (R.) praecocis* (Bozhko)
— Apical segment of rostrum as long as antennal segment III and HT II. Antennal segment III with 4—5 hairs On *Festuca ovina* and *Poa* sp. .... *S. (R.) uvarovi* Mordvilko

Alate viviparous female: Antennae 0.77—1.10 mm long, 0.47—0.53 times body length. Antennal segment III with 4—13 oval rhinaria lying in row in inner margin of this segment. Abdominal tergites I—V with large, oval marginal sclerites and separate small pleural and spinal sclerites; tergite VI with oval marginal sclerites and partially fused pleural and spinal ones, tergites VII—VIII with fused marginal, pleural and spinal sclerites. Dorsal sclerites dark pigmented. Fore wings typical, 2.50—2.80 mm long, with normal venation. Media with 3 branches. Pterostigma weakly pigmented.

Key to species of *Rungsia* (alate viviparous female)

1. Abdominal tergites I—III with large, oval marginal sclerites, pleural and spinal ones small, transverse, tergites IV—VIII with fused marginal, pleural and spinal sclerites .... *S. (R.) maydis* Passerini

— Abdominal tergites I—IV/V with large, oval marginal sclerites, pleural and spinal ones small, tergites V/VI with oval marginal sclerites, pleural and spinal ones partially fused, tergites VII—VIII with fused marginal, pleural and spinal sclerites 2
2. Apical segment of rostrum 0.20—0.21 times antennal segment III and 0.40—0.50 times HT II, antennal segment III with 5—7 rhinaria .... *S. (R.) elegans* Del Guercio
— Apical segment of rostrum 0.23—0.30 times antennal segment III and 0.52—0.55 times HT II, antennal segment III with 6—13 rhinaria .... *S. (R.) arenarii* Mordvilko

Oviparous female: Hind tibiae weakly swollen with numerous (23—49) roundish or irregular shaped pseudosensoria located in whole surface of tibiae.

KEY TO SPECIES OF *RUNGSIA* (oviparous female)

1. Body pear-shaped. Apical segment of rostrum 0.36—0.40 times antennal segment III and 0.61—0.72 times HT II .... *S. (R.) maydis* Passerini
— Body elongate, oval. Apical segment of rostrum 0.27—0.45 times antennal segment III and 0.50—0.62 times HT II 2
2. Terminal process 1.20—1.75 times base. Coloration of live specimens: dark brown. On various grasses .... *S. (R.) elegans* Del Guercio
— Terminal process 2.00—2.20 times base. Coloration of live specimens: yellow with dark green stripes. On *Leymus arenarius* .... *S. (R.) arenarii* Mordvilko

Apterous male: Body elongate, slender 1.17—1.60 mm long. Antennae 0.90—1.08 mm long, 0.56—0.80 times body length. Antennal segment III with 25—49, segment IV with 6—17 rhinaria. Genitalia well developed, strongly sclerotized, dark.

KEY TO SPECIES OF *RUNGSIA* (male)

1. Apical segment of rostrum 0.27—0.34 times antennal segment III and 0.57—0.73 times HT II. On *Leymus arenarius* .... *S. (R.) arenarii* Mordvilko
— Apical segment of rostrum 0.17—0.25 times antennal segment III and 0.46—0.60 times HT II. On various grasses 2
— Antennae 0.67—0.70 times body length. Antennal segment III with 25—30, segment IV with 6—13 rhinaria .... *S. (R.) maydis* Passerini
— Antennae 0.74—0.80 times body length. Antennal segment III with 34—39, segment IV with 6—11 rhinaria .... *S. (R.) elegans* Del Guercio

Sipha (Rungsia) arenarii Mordvilko, 1921
(Figs 82—85, 149—152)

Sipha arenarii Mordvilko, 1921: 57.

Mamontova 1959: 36; Narzikulov 1962: 221—222; Shaposhnikov 1964: 544; Ivanovskaja 1977: 239—240; Heie 1982: 153; Szelegiewicz 1985: 47—48; Qiao, Zhang 2002: 763—764.

Diagnosis: Among other species of the subgenus can be distinguished by rows of short, fine spinules visible on abdominal tergites VI—VIII.

Redescription: apterous viviparous female (Fig. 82a): coloration of live specimens: yellow with greenish longitudinal stripes; pigmentation when mounted: yellowish with apices of antennae and tarsi dusky. Body ellipsoidal 1.82—2.20 mm long and 0.85—1.10 mm wide. Head about 0.30 mm long and 0.40 mm wide. Front of head slightly convex. Head and prothorax not fused (some specimens with partially fused head and prothorax). Sculpture (very short, fine spinules arranged in parallel rows) visible only on abdominal tergites VI—VIII. Dorsal chaetotaxy: setae arranged in 3 rows, on margin of thorax and abdomial tergites I—VI 0.10—0.125 mm long, pleural and spinal ones 0.05—0.075 mm long, among them shorter hairs 0.04—0.05 mm long; on abdomial tergites VII and VIII 0.125—0.15 mm long. Head chaetotaxy: 2 rows of pointed hairs 0.10—0.125 mm long, among them shorter hairs 0.05—0.075 mm long. Antennae (Fig. 82b) reaching to posterior margin of mesothorax, 0.34—0.37 times body length. Vb:Va 1.66—1.90; other antennal ratios: Vb:III 0.46—0.56, V:III 0.78—0.90, V:IV 2.27—2.50. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 1—2 hairs, segm. III with 6—7 hairs, segm. IV with 1—2 hair, Va with 1 hair. Antennal hairs 0.05—0.06 mm long; the longest antennal hair III 2.00—2.40 times basal articular diameter of this segment. ARS (Fig. 82c) about 0.10 mm long, 0.31—0.45 times antennal segment III and 0.57—0.80 times HT II. Furcula located on wide, stout base. Legs short; first tarsal chaetotaxy 4:4:4 or 5:5:5 (Fig. 82d). Siphunculi pore-shaped or slightly elevated, 0.05 mm in basal diameter. Cauda (Fig. 82e) 0.125 mm wide, with 2 pointed hairs 0.10—0.125 mm long and 1 fine hair 0.075 mm long.

Measurements of 1 specimen (in mm): (Poland, Bukowno, 11.07.2007, *Leymus arenarius*, leg. K. Wieczorek) body: 1.90, ant.: 0.77, ant. segm. (III—V): 0.29:0.10:(0.08+0.14), ARS: 0.10, HT II: 0.16.

Redescription: alate viviparous female: coloration of live specimens: head and thorax dark brown to black, abdomen green; pigmentation when mounted: head, thorax, antennae, legs dark, Va, tibiae and abdomen pale, abdominal sclerites dusky. Body 1.55—1.92 mm long and about 0.65 mm wide. Abdominal tergites I—V with large, oval marginal sclerites, pleural and spinal ones small, oval. Tergite VI with large, irregular marginal sclerites and partially fused pleural and spinal sclerites; tergites VII and VIII with fused marginal, pleural and spinal sclerites (Fig. 83a). Head (Fig. 83b) and dorsal chaetotaxy: setae pointed, fine, more numerous than in apt. viv. fem. Antennae (Fig. 83c) reaching to posterior margin of metathorax, 0.49—0.53 times body length. Vb:Va 1.37—2.09; other antennal ratios: Vb:III 0.36—0.52, V:III 0.78—0.83, V:IV 2.20—2.27. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 4—5 hairs, segm. IV with 1—2 hair, Va with 1 hair. Antennal hairs 0.055—0.075 mm long; the longest antennal hair III 2.00—3.00 times basal articular diameter of this segment. Segment III with 6—13, segment IV with 0 rhinaria. ARS 0.09—0.10 mm long, 0.23—0.30 times antennal segment III and 0.52—0.55 times HT II. Siphunculi short, elevated, about 0.075 mm in basal diameter. Fore wings typical (Fig. 83d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Poland, Bukowno, 11.07.2007, *Leymus arenarius*, leg. K. Wieczorek) body: 1.55, ant.: 0.77, ant. segm. (III—V): 0.30:0.11:(0.08+0.11), ARS: 0.09, HT II: 0.17.

Redescription: oviparous female (Fig. 84a): coloration of live specimens: yellow with dark green stripes; pigmentation when mounted: pale except for apices of tarsi and hind tibiae which are dusky. Body elongate, oval 2.05—2.42 mm long and 0.90—1.10 mm wide. Abdominal tergites with small marginal, pleural and spinal intersegmental plates. Dorsal chaetotaxy: hairs numerous, pointed, not arranged in visible rows; on margin of thorax and abdomen 0.075—0.10 mm long, on tergites VI—VIII 0.12—0.15 mm long; across tergites hairs 0.04—0.06 mm long and 0.075—0.11 mm long. Head chaetotaxy: hairs numerous 0.05—0.10 mm long and 0.12—0.15 mm long. Antennae (Fig. 84b) reaching to middle of mesothorax, 0.30—0.37 times body length. Vb:Va 2.00—2.20; other antennal ratios: Vb:III 0.57—0.68, V:III 0.85—1.0, V:IV 2.20—2.50. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 1—2 hairs, segm. III with 5—9 hairs, segm. IV with 1—2 hairs, Va with 0—1 hair. The longest antennal hair III 2.00—3.00 times basal articular diameter of this segment. ARS about 0.10 mm long, 0.28—0.45 times antennal segment III and 0.58—0.62 times HT II. Hind tibiae (Fig. 84c) slightly swollen with 36—44 roundish or irregular shaped pseudosensoria on whole surface of tibiae. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (Poland, Bukowno, 12.10.2007, *Leymus arenarius*, leg. K. Wieczorek) body: 2.07, ant.: 0.67, ant. segm. (III—V): 0.25:0.10:(0.075+0.15), ARS: 0.10, HT II: 0.16.

Redescription: apterous male (Fig. 85a): coloration of live specimens: brown; pigmentation when mounted: yellowish, genitalia and dorsal sclerites dusky. Body elongate, slender 1.40—1.60 mm long and 0.55—0.60 mm wide. Abdominal tergites with very small marginal, pleural and spinal sclerites. Dorsal chaetotaxy: hairs pointed, arranged in marginal pleural and spinal rows 0.10—0.12 mm long. Antennae (Fig. 85b) long, reaching to abdominal segment II, 0.56—0.67 times body length. Terminal process very long, about 2.10—2.50

times base; other antennal ratios: Vb:III 0.45—0.82, V:III 0.67—1.20, V:IV 1.47—2.30. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 1—2 hairs, segm. III with 3—6 hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs long, the longest antennal hair III about 3.00 times basal articular diameter of this segment. Segment III with 30—49, segment IV with 12—17 rhinaria. ARS about 0.10 mm long, 0.27—0.34 times antennal segment III and 0.57—0.73 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 85c).

Measurements of 1 specimen (in mm): (Poland, Bukowno, 12.10.2007, *Leymus arenarius*, leg. K. Wieczorek) body: 1.55, ant.: 0.96, ant. segm. (III—V): 0.29:0.15:(0.11+0.24), ARS: 0.10, HT II: 0.175.

Material examined: Type material: Holotype: *Elymus arenarius*, diunes, 17.07.1911, leg. A. Mordvilko, 2 apt. viv. (ZMAS).
Other material: 5 apt. viv., 1 al. from Sweden (MZLU); 11 apt. viv., 6 al. viv., 8 ovip., 7 males from Poland (UŚ); 2 apt. viv. from Poland (ZMPA); 1 apt. viv., 1 al. viv., 2 ovip. from Denmark (ZMUC).

Geographical Distribution (Map 19): Belgium (Viroinval: Nieto Nafría et al. 1999: 36); China (Inner Mongolia (Wulan haote): Qiao, Zhang 2002: 764), Denmark (Humblebaek: Heie 1982: 153); Finland (Nyland, Karelia, Satakunta: Albrecht 2007: 7), Kazakhstan (Shaposhnikov 1964: 544, Juchnevitsh 1968: 69), Latvia (Garciems: Rupais 1989: 89), Moldova (Tuzora: Bozhko 1957c: 227, Verescagin et al. 1985: 44), Norway (Bø: Ossiannilsson 1962: 41); Poland (Władysławowo, vicinity of Krynica Morska, Olsztyn, Bydgoszcz, Poznań, Warszawa, Błędowska Desert: Wieczorek 2006—2007: 24, Bukowno: Wieczorek 11.07.2007, 12.10.2007 UŚ Collection); Russia (St. Petersburg: Mordvilko 1948: 207, Shaposhnikov 1964: 544, West Siberia-Ust-Tshurulka: Ivanovskaja 1977: 240), Sweden (Skåne, Halland,

Map 19. *S. (R.) arenarii* — geographical distribution

Gotland: OSSIANNILSSON 1969: 34) Tajikistan (Wahzska Valley: NARZIKULOV 1962: 222).

This species is connected with very arid environment; usually with dune areas (e.g. the North Sea coast, the Baltic Sea coast), as well as inland dunes and sand-pits (e.g. Poland, Bukowno).

HOST PLANT: The main host plant of this species is *Leymus arenarius* (L.) Hochst., however, in Tajikistan, Vahzska Valley apterous and alatae viviparous females were collected from *Avena ludoviciana* Dur., whereas in Moldova from *Elymus hispidus* (Opiz) Melderis.

LIFE HISTORY: Fundatrix (green) and its offspring appear in the middle of April. The colonies of apterous viviparous females (yellow with greenish longitudinal stripes) live on the uppersides and undersides of leaves to the end of October. Alatae viviparous females (with head and thorax dark and abdomen green), less numerous than apterous females occur in the middle of June and have been observed to August. Oviparous females (yellow with dark green stripes) and males (brown) occur in September and have been observed to the end of October. The aphids are usually attended by ants.

Sipha (Rungsia) burakowskii Holman, Szelegiewicz, 1974
(Figs 86, 153)

Sipha burakowskii HOLMAN, SZELEGIEWICZ 1974: 10—13.

Diagnosis: This species can be distinguished by numerous, robust hairs covered the body.

Redescription: apterous viviparous female (Fig. 86a): coloration of live specimens: grayish green with brownish spots (HOLMAN, SZELEGIEWICZ 1974); pigmentation when mounted: dirty yellow with apices of antennae, femora, tarsi and siphunculi dark. Body oval 2.10—2.15 mm long and 1.00—1.10 mm wide. Head about 0.27 mm long and 0.40 mm wide. Front of head slightly convex. Abdominal tergites without visible sculpture, with small brownish pleural and spinal plates. Dorsal chaetotaxy: setae numerous, robust, arranged in 3 rows, on margin of thorax and abdominal tergites I—VI 0.10—0.125 mm long, pleural and spinal ones 0.075—0.10 mm long; among them numerous, short, thorn-like hairs 0.025—0.06 mm long; tergites VII—VIII with hairs 0.15—0.175 mm long. Head chaetotaxy: pointed hairs 0.09—0.10 mm long on apex and margin of head; numerous, shorter hairs 0.035—0.05 mm long among them and towards to mid of head. Antennae (Fig. 86b) reaching to anterior margin of mesothorax, 0.30—0.33 times body length. Vb:Va 1.22—1.38; other antennal ratios: Vb:III 0.44—0.76, V:III 0.81—0.84, V:IV 2.01—2.20. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 4—7 hairs (4—5 longer and 2—3 shorter), segm. IV with 2 hairs, Va with 1 hair. Longer antennal hair about 0.06 mm long, shorter ones 0.025—0.03 mm long; the longest antennal hair III about 2.20—3.50 times basal articular diameter of this segment. ARS (Fig. 86c) 0.12—0.14 mm long, 0.50—0.51 times antennal segment III and 0.73—0.77 times HT II. Furcula located on wide, stout base. Legs hairy; first tarsal chaetotaxy 5:5:5 (Fig. 86d). Siphunculi elevated, 0.03 mm in basal diameter. Cauda (Fig. 86e) 0.15 mm wide, with 2 pointed hairs 0.09—0.10 mm long and 2 hairs 0.05—0.75 mm long.

Measurements of 1 specimen (in mm): (Mongolia, 7.08.1963, leg. J. Holman, H. Szelegiewicz, Holotype) body: 2.15, ant.: 0.73, ant. segm. (III—V): 0.27:0.10:(0.09+0.125), ARS: 0.14, HT II: 0.18.

Alate and sexuales: unknown.

MATERIAL EXAMINED: Type material: Holotype: Mongolia, valley of the Saryn river, 7.08.1963, *Aneurolepidium pseudoagropyron*, leg. H. Szelegiewicz, 1 apt. viv., no 4312; Paratypes: Mongolia, valley of the Saryn river, 7.08.1963, *A. pseudoagropyron*, leg. H. Szelegiewicz, 16 apt. viv., no 4313—4330 (ZMPA).
Other material: 8 apt. viv. from Mongolia (ZMPA).

GEOGRAPHICAL DISTRIBUTION (Map 20): Mongolia (Khentey Mts., Valley of the river Sharin HOLMAN, SZELEGIEWICZ 1974: 10—13).
A very local species, known only from few localities in Central Asia.

Map 20. *S. (R.) burakowskii* — geographical distribution

HOST PLANT: Poaceae — *Elymus repens* (L.) Gould, *Leymus chinensis* (Trin.) Tzvel. (=*Aneurolepidium pseudagropyron*).

LIFE HISTORY: The species lives on the upperside of the leaves, in small colonies; not visited by ants.

Sipha (Rungsia) elegans Del Guercio, 1905
(Figs 87—90, 154—157)

Sipha elegans Del Guercio, 1905: 137.

Sipha kurdjumovi Mordvilko, 1921: 56.
Sipha agropyrella Hille Ris Lambers, 1939: 82.
Sipha aegilopis Bozhko, 1961: 12, **new synonym**.
Rungsia nemaydis Narzikulov, 1962: 219—221.

Hille Ris Lambers 1939: 82—83; MAmontova 1959: 35; Shaposhnikov 1964: 544; Müller 1969: 64; Richards 1972: 103—105; Ivanovskaja 1977: 240; Stroyan 1977: 41; Szelegiewicz 1977: 90—91, 1985: 47—48; Heie 1982: 153—155; Nieto Nafría, Mier Durante 1998: 356.

Diagnosis: Among other species of the subgenus can be distinguished by abdominal tergites with small, brownish intersegmental sclerites.

Redescription: apterous viviparous female (Fig. 87a): coloration of live specimens: yellowish brown or dark brown, darker forms with paler median stripe; pigmentation when mounted: dirty yellow, antennal segments I and V, tarsi, siphunculi, intersegmental sclerites dark. Body oval or pear-shaped 1.72—2.15 mm long and 0.80—0.90 mm wide. Head about 0.22 mm long and 0.30 mm wide. Front of head slightly convex. Abdominal tergites without sculpture; with small, brownish intersegmental sclerites. Dorsal chaetotaxy: setae arranged in 3 rows, on margin of thorax and abdominal tergites I—VI 0.10—0.12 mm long, pleural and spinal ones 0.09—0.10 mm long; on abdominal tergites VII and VIII 0.15—0.175 mm long (some specimens, e.g. from the Netherlands (synonym *S. agropyrella*) more hairy with longer, robust thorn-like hairs, or specimens e.g. from Tajikistan (synonym *R. nemaydis*) with hairs arranged in not visible rows with shorter, numerous thorn-like hairs). Head chaetotaxy: 2 rows of pointed hairs 0.10—0.125 mm long. Antennae (Fig. 87b) reaching to posterior margin of mesothorax, 0.37—0.39 times body length. Vb:Va 1.70—2.10; other antennal ratios: Vb:III 0.54—0.65, V:III 0.87—0.95, V:IV 2.25—3.16. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 3—6 hairs, segm. IV with 1 hair. Antennal hairs 0.045—0.06 mm long; the longest antennal hair III about 1.50—2.25 times basal articular diameter of this segment. ARS (Fig. 87c) 0.06—0.075 mm long, 0.24—0.30 times antennal segment III and 0.46—0.50 times HT II. Furcula located on wide, stout base. Legs short; first tarsal chaetotaxy 5:5:5 (Fig. 87d). Siphunculi slightly elevated, 0.05 mm in basal diameter. Cauda 0.11 mm wide, with 2 pointed hairs 0.09—0.10 mm and 2 fine hairs 0.04—0.06 mm.

Measurements of 1 specimen (in mm): (Vodskov, 18.08.1962, leg. O.E. Heie) body: 1.72, ant.: 0.68, ant. segm. (III—V): 0.20:0.09:(0.09+0.15), ARS: 0.075, HT II: 0.15.

Redescription: alate viviparous female: coloration of live specimens: head and thorax black, abdomen brownish yellow with dark sclerites (Hille Ris Lambers 1939); pigmentation when mounted: yellow, frons, antennae, legs, cauda and abdominal sclerites dusky. Body 1.77—1.95 mm long and 0.75—0.77 mm wide. Abdominal tergites I—IV with large, oval marginal sclerites, pleural and spinal ones with small transverse sclerites; tergites V—VI with large, oval marginal sclerites and partially fused pleural and spinal sclerites (with siphunculi laying separatly between marginal and spinopleural sclerites on abdominal segment V); tergites VII and VIII with fused marginal, pleural and spinal sclerites (Fig. 88a). Head (Fig. 88b) and dorsal chaetotaxy: setae pointed, fine, more numerous than in apt. viv. fem. Antennae (Fig. 88c) reaching to posterior margin of metathorax, 0.47—0.53 times body length. Vb:Va 2.00—2.60; other antennal ratios: Vb:III 0.68—0.74, V:III 1.00—1.03, V:IV 2.40—2.72. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 4—6 hairs, segm. IV with 2 hairs, Va with 1 hair. Antennal hairs about 0.055 mm long; the longest antennal hair III about 2.20 times basal articular diameter of this segment. Segment III with 5—7, segment IV with 0 rhinaria. ARS 0.075 mm long, 0.20—0.21 times antennal segment III and 0.40—0.50 times HT II. Siphunculi short, stump-shaped, about 0.075 mm in basal diameter. Fore wings typical (Fig. 88d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (France, Quineville (Manche), 14.06.1973, leg. Latge, Michell) body: 1.77, ant.: 0.84, ant. segm. (III—V): 0.29:0.11:(0.10+0.30), ARS: 0.06, HT II: 0.15.

Redescription: oviparous female (Fig. 89a): coloration of live specimens: dark brown; pigmentation when mounted: yellowish with paler longitudinal median stripe, antennal segments I, IV and V, apices of tarsi and abdominal plates dusky. Body elongate, oval 1.85—2.04 mm long and 0.80—0.95 mm wide. Abdominal tergites with small marginal, pleural and spinal intersegmental plates. Dorsal chaetotaxy: hairs not numerous, pointed, arranged in 3 rows: on margin of thorax and abdominal tergites I—V 0.075—0.09 mm long, on tergites VI—VIII 0.12—0.15 mm long; pleural and spinal hairs of abdominal tergites I—VI 0.06—0.09 mm long, on tergites VII—VIII 0.125—0.15 mm long; across tergites fine hairs 0.03—0.05 mm long. Head chaetotaxy: hairs numerous, about 0.125 mm long and 0.04—0.06 mm long. Antennae (Fig. 89b) 0.31—0.34 times body length. Vb:Va 1.20—1.75; other antennal ratios: Vb:III 0.44—0.62, V:III 0.80—1.00, V:IV 2.20—2.60. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 1—2 hairs, segm. III with 4—6 hairs, segm. IV with 1—2 hairs, Va with 0—1 hair. The longest antennal hair III about 2.00 times basal articular diameter of this segment. ARS 0.075—0.09 mm long, 0.27—0.37 times antennal segment III and 0.50—0.60

times HT II. Hind tibiae (Fig. 89c) slightly thickened with 24—49 roundish pseudosensoria on 3/4 surface of tibiae. Other character as in apt. viv. fem.

Measurements of 1 specimen (in mm): (France, Villeneuve la Salle H.A.), 23.10.1969, leg. Remaudieré) body: 1.99, ant.: 0.63, ant. segm. (III—V): 0.24:0.08:(0.08+0.12), ARS: 0.09, HT II: 0.15.

Redescription: apterous male (Fig. 90a): coloration of live specimens: brown; pigmentation when mounted: dark with long, paler median longitudinal stripe, antennal segments III, IV, V, dorsal sclerites and genitalia dusky. Body elongate, slender 1.42—1.45 mm long and 0.55—0.57 mm wide. Abdominal tergites with oval, marginal sclerites and very small pleural and spinal ones. Dorsal chaetotaxy: hairs pointed, arranged in marginal, pleural and spinal rows 0.10—0.125 mm long. Head chaetotaxy: hairs pointed, numerous 0.09—0.125 mm long. Antennae (Fig. 90b) long, reaching to abdominal segment II, 0.74—0.80 times body length. Terminal process very long, 1.38—2.75 times base; other antennal ratios: Vb:III 0.62—0.84, V:III 0.89—1.07, V:IV 2.50—2.86. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 5—6 hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs long, the longest antennal hair III 2.40—2.60 times basal articular diameter of this segment. Segment III with 34—39, segment IV with 6—11 rhinaria. ARS 0.075—0.08 mm long, 0.18—0.20 times antennal segment III and 0.50—0.53 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 90c).

Measurements of 1 specimen (in mm): (France, La Grave, H.A. 19.10.1986, leg. Remaudieré) body: 1.45, ant.: 1.08, ant. segm. (III—V): 0.39:0.14:(0.12+0.33), ARS: 0.08, HT II: 0.15.

MATERIAL EXAMINED: Type material: Lectotype: Italy, near Florence, 28.05.1904, *Triticum* sp., 1 apt. viv., leg. Del Guercio (Di.P.S.A.); Paralectotypes: Italy, near Florence, 28.05.1904, *Triticum* sp., 7 apt. viv., leg. Del Guercio (Di.P.S.A.)

Other material: 4 apt. viv., 1 al. viv. from the Netherlands (BMNH); 12 apt. viv. from Italy (Di.P.S.A.); 2 apt. viv. from Liaoning, China (IOZ, CAS); 1 apt. viv., 1 al. viv. from Afganistan, 2 al. viv. from Iran, 2 al. viv. from Turkey, 8 apt. viv., 3 al. viv., 4 ovip., 3 males from France (MNHN); 4 apt. viv. from Sweden (MZLU); 4 apt. viv., 3 al. viv. from the Netherlands (RMNH); 4 ovip., 3 males from Poland (UŚ); 4 apt. viv. from Denmark (ZMUC).

GEOGRAPHICAL DISTRIBUTION (Map 21): Type locality: near Florence, Italy. Afganistan (Kabul, Ghodge Konti: MNHN Collection); Bulgaria (TASHEV 1984: 34); Belgium (Gambloux: MNHN Collection); Canada (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland: MAW et al. 2000: 29); China (Jiling, Liaoning: TAO 1999: 55, Liaoning (Shenyan, Fuxin): QIAO, ZHANG 2002: 764—765); Croatia (GOTLIN CULJAK, IGRC BARCIC 2002: 258); Czech Republic (HOLMAN, PINTERA 1977: 104, Palava Biosphere Reserve: HOLMAN 1995: 194); Denmark (Jutland, Zealand: HEIE 1982: 153—155); Finland (Helsinki, Tikkurila: HEIKINHEIMO 1966: 1, ALBRECHT 2007: 7); France (Villeneuve-les-Maguelon, Beaucaire: Leclant 1966: 121, Quineville (Manche): Remaudieré et al. 1980: 350, Villeneuve la Salle H.A., la Grave H.A.: MNHN Collection); Germany (Rostock: Müller 1964: 273); Greece (Tsitsipis et al. 2007: 36, Saloniki: MNHN Collection); Hungary (Lajozsmizse: Pintera, Szalay-Marzso 1962: 129, Lajozsmizse, Keszthely, Kopasz-hegy: Szelegiewicz 1977: 91); Iran (Shiraz District:: Hodjat 1998: 77, near Mashad, near Rine, Meygoun, Baraghan, Homedan, Isfahan, near Sanandaj (Salaratabrad), Zangoule, Reraïch, Tabriz, near Shiraz: MNHN Collection); Italy (Grado: Wood-Baker 1953: 69, Perugia: Wood-Baker 1964: 46, Sicilia, Misterbianco, Valguarnera: Barbagallo, Stroyan 1980: 31, Trentino Alto, Merano, Toscana, Campania, Sardinia, Sicilia: Roberti 1990—1991: 130, North and South Italy, Sicilia, Sardinia: Barbagallo et al. 1995: 21); Kazakhstan (Juchnevitsh 1968: 69, Almatynski Reserve: Kadyrbekov 2002: 77); Kyrgyzstan (Frounze: Nevski 1929: 341); Latvia (Riga: Rupais 1979: 45, Riga, Cesis: 1989: 88); Moldova (Bozhko 1957c: 226, Tuzora: 1961: 12, 13; Verescagin et al. 1985: 44); Norway (Ossiannilsson 1962: 41; Onsøy,Tangen: Tambs-Lyche, Heie 1994: 73); Pakistan (Mahmood et al. 2002: 49—50); Poland (vicinity of Kąty Rybackie, Przebrno, Władysławowo, Olsztyn, Bydgoszcz, Poznań, Warszawa, Wrocław, Trzebinia, Błedowska Desert, Sosnowica: Wieczorek 2006—2007: Żabie Doły near Bytom: Wieczorek 5.06.2008, 22.08.2008, 15.10.2008 UŚ Collection); Portugal (Oeiras: Ilharco 1991—1995: 40); Romania (Cernica: Holman, Pintera 1981: 32); Russia (Mordvilko 1948: 206, Groznenska Distr., Stavropolski Kray: Bozhko 1957a: 45, 1959: 22, Shaposhnikov 1964: 544, West Siberia: Ivanovskaja 1976: 179, Novosibirsk, Novy Sharan, Altay: 1977: 240, Primorsk Territory: Pastshenko 1988: 83); Serbia (Cacak, Belgrade Lukovac, Mosćanica, Valijevo: Tanasijević, Eastop 1963: 268, Surcin, Kovilovo, vicinity of Belgrade: Petrovic 1996: 163); Slovakia (Holman, Pintera 1977: 104); Spain (Leon, Salamanca, Soria, Zaragoza: Nieto Nafría, Mier Durante 1998: 366—368); Sweden (Falsterbo, Landskrona, Asa, Alvesta, Uppsala: Ossiannilsson 1959: 391, 392); Switzerland (Hallau, Sion, Solothurn, Nyon: Lampel, Meier 2003: 174); Syrie (Bloudane: Remaudiere, Talhouk 1999: 166); Tajikistan (Narzikulov 1962: 219—221); Turkey (Ahlat (Lake Van): Tuatay, Remaudieré 1964: 247, near Eregli: MNHN Collection); Ukraine (Odesska distr.: Bozhko 1950: 227, Krym, Rybare: 1957b: 212, Pyrey: 1957c: 226, Kievska, Czernogorska, Mikolaebska distr: 1959: 70, 71, Mamontova 1949: 92, Uzgorodsky distr.: Mamontova-Solukha 1963: 29, vicinity of Kiev: 1964: 62); United Kingdom (Haywards Heath (Sussex): Wood-Baker 1953: 69; Kew: Eastop 1965: 396); United States (Maine: Path 1910: 241, California, Idaho, Illinois, Iova, Kansas, Massachusetts, New Jersey, New York, North Dacota, Pennsylvania, South Dacota, Virginia, Wisconsin: Smith, Parron 1978: 270, Utah: Knowlton 1983: 82); Uzbekistan (Djar-Kourgen: Nevski 1929: 341, 1949: 128).

A Palaearctic, widely distributed species, introduced into Canada and United States.

Map 21. *S. (R.) elegans* — geographical distribution

Host Plant: Poaceae — *Achnatherum calamagrostis* (L.) Beauv., *Aegilops biuncialis* Vis., *A. crassa* Boiss., *A. cylindrica* Host., *A. geniculata* Roth, *A. kotschyi* Boiss., *A. tauschii* Coss., *A. triuncialis* L., *A. umbellulata* Zhuk., *A. ventricosa* Tausch, *Agropyron cristatum* (L.) Gaertn., *A. pectinatum* (Bieb.) Beauv., *A. trachycaulum* (Link) Malte ex H.F. Lewis, *Agrostis stolonifera* L., *Alopecurus pratensis* L., *Ammophila arenaria* (L.) Link., *Aneurolepidium chinense* (Trin.) Kitag., *Arrhenatherum eliatus* (L.) P. Beauv. ex J.&C. Presl., *Avenula pratensis* (L.) Dumort, *Brachypodium phoenicoides* (L.) Roemer&Schultes, *B. retusum* (Pers.) Beauv., *Bromus erectus* Hudson, *B. inermis* Leyss., *Chrysopogon gryllus* (L.) Trin., *Dactylis glomerata* L., *Elymus hispidus* (Opiz) Melderis, *E. hispidus barbulatus* (Schur) Melderis, *E. pungens* (Pers.) Melderis, *E. repens* L., *E. trachycaulus* (Link) Gould ex Shinners, *Festuca arundinacea* Schreb., *F. ovina* L., *F. pratensis* Huds., *F. rubra* L., *Hordeum brevisibulatum* (Trin.) Link., *H. bulbosum* L., *H. jubatum* L., *H. murinum* L., *H. vulgare* L., *Lolium perenne* L., *Panicum* sp., *Phacelurus speciosus* (Steud.) C.E. Hubb., *Phalaris arundinacea* L., *Phleum pretense* L., *Poa annua* L., *P. trivialis* L., *Polypogon fugax* Nees ex Steud., *Puccinellia distans* (L.) Parl., *P. maritime* (Hudson) Parl., *Secale cereale* L., *Setaria italica* (L..) Beauv., *S. pumila* (Poiret) Roem.&Schult., *S. verticillata* (L.) Beauv., *S. viridis* (L.) Beauv., *Sorghum sudanense* (Piper) Stapf, *Trisetum* sp., *Triticum aestivum* L., *T. baeoticum* Boiss., *T. durum* Desf., *T. turanicum* Jakulz.
Juncaceae — *Juncus compressus* Jacq.
Cyperaceae — *Carex distans* L.
The main host plant is *Elymus repens*.

Life History: The species lives on the upper surfaces of the leaf blades of grasses and cereals, occasionally sedges, often causing them to roll upwards and develop yellow patches. The presence of feeding colonies causes necrotic areas on plant leaves; sometimes visited by ants.

Common name: the quackgrass aphid.

Notes: vector of barley yellow dwarf *luteovirus*. Dixon and Shearer (1974) investigated the factors that determine choice of feeding site of *S. (R.) elegans* on grasses.

Sipha (Rungsia) maydis Passerini, 1860
(Figs 91—94, 158—161)

Sipha maydis Passerini, 1860: 38.

Sipha graminis Kaltenbach, 1874: 756, 575.
Sipha avenae Del Guercio, 1900a: 144.
Sipha maydis var. *avenae* Del Guercio, 1905: 144.
Rungsia graminis Mimeur, 1933: 104.
Sipha brunnea Nevsky, 1951: 43—44.

Silvestri 1939: 430; Mamontova 1959: 34; Narzikulov 1962: 218, 219; Shaposhnikov 1964: 544; Tuatay, Remaudieré 1964: 247; Müller 1969: 64; Chakrabarti 1977: 222, 223; Ivanovskaja 1977: 241; Stroyan 1977: 41; Szelegiewicz 1977: 90, 91, 1985: 47, 48; Ghosh 1980: 101—103; Heie 1982: 155; Nieto Nafría, Mier Durante 1998: 368—370.

Diagnosis: This species can be distinguished by body flattened, pear-shaped brown to dark brown (live specimens: shining carbon black).

Redescription: apterous viviparous female (Fig. 91a): coloration of live specimens: shining black; pigmentation when mounted: brown to dark brown with antennal segment III paler. Body oval or pear-shaped 1.50—1.90 mm long and 0.95—1.05 mm wide. Head about 0.22 mm long and 0.35 mm wide. Front of head almost flat. Sculpture (very short, fine, spinules arranged in parallel rows) forming reticulate pattern visible only on thorax and abdominal tergites VI—VIII. Dorsal chaetotaxy: setae arranged in 3 rows, marginal ones 0.10—0.125 mm long, pleural and spinal ones 0.05—0.075 mm long, among them few, shorter hairs 0.04—0.05 mm long. Head chaetotaxy: 2 rows of pointed hairs 0.09—0.12 mm long and 0.05—0.075 mm long close to margin of head. Antennae (Fig. 91b) reaching to anterior margin of metathorax, 0.41—0.53 times body length. Vb:Va 1.50—1.81; other antennal ratios: Vb:III 0.54—0.57, V:III 0.83—0.96, V:IV 2.06—3.33. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 6—8 hairs, segm. IV with 2 hairs, Va with 1 hair. Antennal hairs 0.025—0.06 mm long; the longest antennal hair III 2.00—2.40 times basal articular diameter of this segment. ARS (Fig. 91c) 0.09—0.10 mm long, 0.27—0.34 times antennal segment III and 0.60—0.62 times HT II, with 2 or 3 secondary hairs. Furcula usually with separate arms. Legs short; first tarsal chaetotaxy 5:5:5 (Fig. 91d). Siphunculi slightly elewated, 0.03 mm in basal diameter. Cauda 0.125 mm wide, with 2 pointed hairs 0.10—0.125 mm long and 2 fine hairs 0.075—0.10 mm long.

Measurements of 1 specimen (in mm): (Poland, Warszawa, 10.06.1962, leg. H. Szelegiewicz.) body: 1.90, ant.: 1.05, ant. segm. (III—V): 0.37:0.15:(0.11+0.20), ARS: 0.10, HT II: 0.16.

Redescription: alate viviparous female: coloration of live specimens: black; pigmentation when mounted: dark with antennal segments II, III, IV and tarsi pale, abdominal sclerites dusky. Body 1.57—2.10 mm long and 0.70—0.80 mm wide. Abdominal tergites I—III with large, oval marginal sclerites, pleural and spinal ones small, transverse (the biggest on abdominal tergite III); tergites IV—VIII with fused marginal, pleural and spinal sclerites (cross bars), which includs siphuncular bases on abdomianl tergite V (Fig. 92a). Head (Fig. 92b) and dorsal chaetotaxy: setae pointed, fine, more numerous than in apt. viv. fem., on abdomen not arranged in visible rows. Antennae (Fig. 92c) reaching to abdominal segment I, 0.52—0.53 times body length. Vb:Va 0.88—1.14; other antennal ratios: Vb:III 0.51—0.54, V:III 0.95—0.96, V:IV 2.35—2.50. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 5—6 hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs 0.03—0.05 mm long; the longest antennal hair III 2.00—3.00 times basal articular diameter of this segment. Segment III with 4—7, segment IV with 0 rhinaria. ARS 0.075—0.10 mm long, 0.23—0.24 times antennal segment III and 0.50—0.52 times HT II. Siphunculi short, elevated, about 0.075 mm in basal diameter. Fore wings typical (Fig. 92d). Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (the Netherlands, 28.06.1963, leg. Noordam) body: 1.57, ant.: 0.90, ant. segm. (III—V): 0.31:0.12:(0.14+0.16), ARS: 0.075, HT II: 0.15.

Redescription: oviparous female (Fig. 93a): coloration of live specimens: dark brown to black; pigmentation when mounted: paler than apt. viv. fem., dorsal sclerites dark. Body oval 1.35—1.50 mm long and 0.75—0.82 mm wide. Abdominal tergites sclerotized with small, transverse marginal, pleural and spinal plates. Sculpture (rows of minute spinules) more visible than in apt. viv. fem. Antennae (Fig. 93b). reaching to anterior margin of mesothorax, 0.41—0.44 times body length. Vb:Va 1.22—1.56; other antennal ratios: Vb:III 0.50—0.56, V:III 0.90—0.95, V:IV 2.10—2.22. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 1 hair, segm. III with 4—5 hairs, segm. IV with 1 hair, Va with 1 hair. The longest antennal hair III 2.00—3.00 times basal articular diameter of this segment. ARS about 0.08—0.10 mm long, 0.36—0.40 times antennal segment III and 0.61—0.72 times HT II. Hind tibiae (Fig. 93c) slightly thickened with 23—48 roundish pseudosensoria on whole surface of tibiae. Other characters as in apt. viv. fem.

Measurements of 1 specimen (in mm): (the Netherlands, 23.09.1979, leg. Noordam) body: 1.50, ant.: 0.62, ant. segm. (III—V): 0.22:0.10:(0.08+0.125), ARS: 0.08, HT II: 0.13.

Redescription: apterous male (Fig. 94a): coloration of live specimens: black; pigmentation when mounted: yellowish, antennae, genitalia and dorsal sclerites dusky. Body elongate, slender 1.17—1.40 mm long and 0.47—0.52 mm wide. Abdominal tergites with very small, transverse marginal, pleural and spinal sclerites. Sculpture (rows of minute spinules) more visible than in apt. viv. fem. Antennae (Fig. 94b) long, reaching to abdominal segment II, 0.67—0.70 times body length. Vb:Va 1.70—2.25; other antennal ratios: Vb:III 0.56—0.69, V:III 0.90—1.02, V:IV 2.25—2.66. Antennal chaetotaxy: segm. I with 3 hairs, segm. II with 2 hairs, segm. III with 6 hairs, segm. IV with 2 hairs, Va with 1 hair. Antennal hairs about 0.05 mm long, the longest antennal hair III about 3.0 times basal articular diameter of this segment. Segment III with 25—30, segment IV with 6—13 rhinaria. ARS about 0.075 mm long, 0.17—0.25 times antennal segment III and 0.46—0.60 times HT II. Genitalia well developed, strongly sclerotized, dark (Fig. 95c).

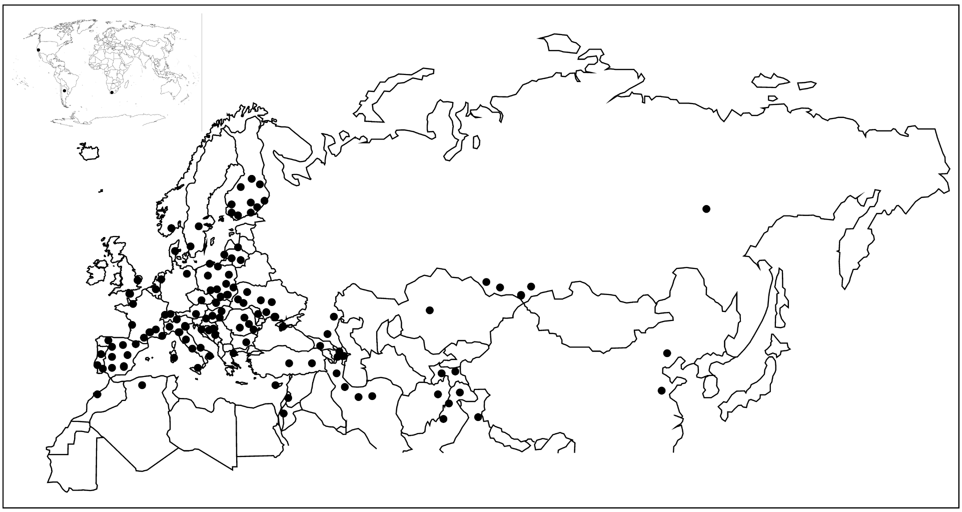
Measurements of 1 specimen (in mm): (Poland, Katowice, 15.10.2000, leg. K. Wieczorek) body: 1.36, ant.: 0.90, ant. segm. (III—V): 0.32:0.15:(0.11+0.20), ARS: 0.075, HT II: 0.15.

MATERIAL EXAMINED: No type material traced.
Other material: 4 apt. viv. from Great Britain, 7 apt. viv., 1 male from Cyprus (BMNH); 8 apt. viv. from Italy (Di.P.S.A.); 3 apt. viv. from Xinjiang, China (IOZ, CAS); 4 apt. viv., 3 al. viv. from Iran, 1 apt. viv. from Turkey, 7 apt. viv., 3 al. viv. from France (MNHN); 2 apt. viv. from Sweden (MZLU); 4 apt. viv., 3 al. viv. from the Netherlands (RMNH); 2 ovip., 3 males from Poland (UŚ); 5 apt. viv., 1 al. viv. from Poland, 4 apt. viv. from Hungary (ZMPA).

GEOGRAPHICAL DISTRIBUTION (Map 22): Afganistan (vicinity of Kalbal Hab: NARZIKULOV, UMAROV 1971: 96, Ghodge Konti: MNHN Collection); Algeria (MNHN Collection); Austria (Klagenfurt: WOOD-BAKER 1953: 69; BÖRNER, FRANZ 1956: 313); Argentina (ORTEGO et al. 2004: 25; CORRALES et al. 2007: 1781); Azerbaijan (Stepanakerta, Dzamili, Szyszi, Tazaxshar: RUSANOVA 1942: 43); Belgium (NIETO NAFRIA et al. 1999: 20); Bulgaria (Corbadzev: PINTERA 1959: 72, TASHEV 1966: 41, 1984: 35); China (Hebei (Chengde), Xinjiang (Yili): QIAO, ZHANG 2002: 765—766); Croatia (GOTLIN CULJAK, IGRC BARCIC 2002: 258); Czech Republic (HOLMAN, PINTERA 1977: 104); Cyprus (Nicosia: LEONARD 1967: 263); Denmark (Jutland: HEIE 1982: 155); Finland (ALBRECHT 2007: 7); France (Montpellier: LECLANT 1966: 120, Montarnaud, Lantosqua, Blagon, Lege (Gironde) Marseillon (Herault): MNHN Collection); Georgia (Zestafoni: ABASHIDZE 1951: 433, Kahetia: DHIBLADZE 1958: 296); Germany (BÖRNER 1952: 54, 55, Rostock: MÜLLER: 1964: 273); Greece (Kilkis: REMAUDIERE 1982: 109, TSITSIPIS et al. 2007: 36); Hungary (Kecskement: PINTERA, SZALAY-MARZSO 1962: 128, 129, Gyongyos, Karascond, Banhegyes, Simontornya, Satoristye, vicinity of Budapest: SZELEGIEWICZ 1977: 91); Iran

(Teheran: REZWANI 1987: 74, Teheran, Karaj, Nowshahr, Orumieh, the Caspian Sea Region: HODJAT 1998: 78, Baraghan, Shiraz, Khash, Karadj, Tabriz: MNHN Collection); Israel (Rehovot: BODENHEIMER, SWIRSKI 1957: 252); India (Himachal Pradesh: CHAKRABARTI 1977: 222, GHOSH 1980: 101—104); Italy (SILVESTRI 1939: 430, Bologna, Ferrara, Piemont, Liguria, Emilia, Toscania, Calabria, Sardinia: MARTELLI 1950: 279; Perugia: WOOD-BAKER 1964: 46; Sicilia, Caltagirone, Giarattana, Motta S. Anastasia, Marina di Rugosa, Fiumefreddo, Fornazzo, Catania: BARBAGALLO, STROYAN 1980: 31, Liguria, Trentino Alto, Piemonte, Emilia, Toscana, Lazio, Sabaudia, Campania, Calabria, Sardinia, Sicilia: ROBERTI 1990—1991: 129, North and South Italy, Sicilia, Sardinia: BARBAGALLO et al. 1995: 21); Kazakhstan (Karzan-tay: NEVSKI 1951: 43, JUCHNEVITSH 1968: 69, Central Kazakhstan: SMAILOVA 1971: 21); Latvia (Riga: RUPAIS 1979: 45, Riga, Koknese: 1989: 89); Lebanon (Bekaa: BODENHEIMER, SWIRSKI 1957: 252; REMAUDIERE, TALHOUK 1999: 167); Lithuania (Jonava, Ukmerge: JURONIS 1984: 14, Kuronian Spit: RAKAUSKAS et al. 2008: 100); Maroco (Rabat: MIMEUR 1933: 104—108); Moldova (BOZHKO 1957c: 226, VERESCAGIN et al. 1985: 44); the Netherlands (HILLE RIS LAMBERS 1939: 84); Norway (TAMBS-LYCHE, HEIE 1994: 73); Pakistan (Thal, Dir Kohistan: NAUMANN-ETIENNE, REMAUDIERE 1995: 49; Parachinar, Quetta: MAHMOOD et al. 2002: 47—49), Poland (Władysławowo, Tczew, Bory Tucholskie, Olsztyn, Bydgoszcz, Poznań, Warszawa, Katowice, Błędowska Desert, Krzyżanowice, Puławy, Lublin, Sowie Mts., Żywiecka Dale, Bieszczady Mts: WIECZOREK 2006—2007: 24, 25, Dąbrowa Górnicza, Żabie Doły near Bytom, Czatachowa: WIECZOREK 20.07.08, 05.10.08, 04.06.09, 24.08.09, 12.10.09, 27.10.09 UŚ Collection); Portugal (Almeirim, Cascais, Oeiras, Azeitao: ILHARCO 1973: 75, 76, Ericeira, Oeiras: VAN HARTEN 1975: 221); Romania (Cristeti, Stefanesti: BORCEA 1909: 250, Bucarest, Saftica, Breaza, Murighiol, Golesti: HOLMAN, PINTERA 1981: 32, Braila: CZYLOK 1987: 35); Russia (MORDVILKO 1921: 56, 1929: 86—90, Central Asia: NEVSKI 1949: 128, Wahska Valley: NARZIKULOV 1954: 47, Kulundynski Steppe, Kluczi: IVANOVSKAJA 1958: 127, West Siberia: 1976: 179, Kulunda, Slavgorod, Kluczi, Altay, Tuva, Kuzedeevo: 1977: 241, 242, Groznenska Distr., Stavropolski Kray: BOZHKO 1957a: 45, SHAPOSHNIKOV 1964: 544, Yakutia: BARANNIK, NOVIKOV 1988: 79, Astrakhan: STEKOLSCHCHIKOV 2005: 325); Serbia (Lukovac, Mosćanica, Donji, Milanovac: TANASIJEVIC, EASTOP 1963: 268, Kovilovo, Near Belgrade, near Bor, Rajac, Zemun, Medane, Zlatar: PETROVIC 1996: 163); Slovakia (HOLMAN, PINTERA 1977: 104); South Africa (Middelburg, Caledon-Cape Province: QUEDNAU 1962: 253, Cape Province: DÜRR, VAN HERDEEN 1969: 111; MILLAR 1990: 14); Spain (Baleares, Alava, Albacete, Alicante, Almeria, Asturia, Barcelona, Cantabria, Castellon, Cordoba, Granada, Guipuzcoa, Huesca, Leon, Lerida, Madrid, Orense, Pontevedra, Salamanca, Soria, Teruel, Valencia: NIETO NAFRIA, MIER DURANTE 1998: 368—371); Sweden (Kavling, Uppsala, Sala: OSSIANNILSSON 1959: 392); Switzerland (Wilderswil, Zurich, Nyon: LAMPEL, MEIER 2003: 175); Tajikistan (Obi-Garmski distr., Si-Thirok, Gissarski

mountain ridge: NARZIKULOV 1962: 218—219); Turkey (West Anatolia: BODENHEIMER, SWIRSKI 1957: 252, Tatvan-Sükran: TUATAY, REMAUDIERE 1964: 246—247); Ukraine (Odesska distr.: BOZHKO 1950: 226, Krym: 1957b: 212, Pyrey: 1957c: 226, Kanev, Belaja Cerkov: MAMONTOVA 1953: 67, Kievska, Poltavska, Czernogorska, Czerkaska, Krymska, Zakarpatska distr.: 1959: 69, Beregove, Zdeneve: MAMONTOVA-SOLUKHA 1963: 29, vicinity of Kiev: 1964: 62—63); United Kingdom (Channel Isles: EASTOP 1953: 155, Kew: 1965: 396); United States (California: SORENSEN et al. 2008: 9—11).
Among Siphini the most common species, widely distributed in Palaerctic as well as introduced into United States, Argentina, South Africa, India and Pakistan.



Map 22. *S. (R.) maydis* — geographical distribution

HOST PLANT: Poaceae — *Aegilops longissima* Schweinf., Muschl.&Eig., *A. peregrina* (Hackel) Maire, *A. truncialis* L., *Agropyron cristatum* (L.) Gaertn., *A. pectinatum* (Bieb.) Beauv., *Agrostis capillaris* L., *A. repens* Sincl., *A. stolonifera* L., *Alopecurus geniculatus* L., *A. pratensis* L., *Andropogon* sp., *Anthoxanthum odoratum* L., *Arrhenatherum album* (Vahl.) W.D. Clayton, *A. elatius* (L.) P. Beauv. ex J.&C. Presl, *Arundo donax* L., *Avena barbata* Pott. ex Link, *A. fatua* L., *A. sativa* L., *A. sterilis* L., *Bothriochloa ischaemum* (L.) Keng, *Brachypodium pinnatum* (L.) Beuv., *Briza minor* L., *Bromus arvensis* L., *B. catharticus* Vahl, *B. erectus* Hudson, *B. hordeaceus* L., *B. inermis* Leyss., *B. madritensis* L., *B. rigens* L., *B. rigidus* Roth, *B. scoparius* L., *B. villosus* Scop., *B. wildenowii* Kunth., *Calamagrostis epigejos* (L.) Roth, *C. pseudophragmites* (Haller f.) Koeler, *Chrysopogon gryllus* (L.) Trin., *Cutandia maritima* (L.) W. Barbey, *Cynodon dactylon* L., *Dactylis glomerata* L., *Deschampsia flexuosa* (L.) Trin., *Digitaria ischaemum* (Schreb.) H.L. Mühl., *Echinochloa crus-gali* (L.) Beauv., *Eleusine coracana* (L.) Gaertn.,

Elymus dahuricus Turcz. ex Griseb., *E. hispidus* (Opiz) Melderis, *E. hispidus barbulatus* (Schur) Melderis, *E. repens* L., *Elytrigia trichophora* (Link) Nevski, *Eragrostis* sp., *Festuca ovina* L., *F. pratensis* Huds., *F. rubra* L., *Holcus lanatus* L., *H. mollis* L., *Hordeum bulbosum* L., *H. distichon* L., *H. murinum* L., *H. vulgare* L., *Imperata cylindrica* (L.) Beauv., *Koeleria phleoides* (Vill.) Pers., *Lagurus ovatus* L., *Leymus condensatus* Presl.&C. Presl., *Lolium multiflorum* Lam., *L. perenne* L., *L. rigidum* Gaudin, *L. temulentum* L., *Molinia caerulea* (L.) Moench., *Oryza sativa* L., *Pennisetum* sp., *Phacelurus speciosus* (Steud.) C.E. Hubb., *Phalaris arundinacea* L., *Phleum commutatum* Gaudin, *P. pratense* L., *Phragmites australis* (Cav.) Trin. ex Steudel,, *Poa alpina* L., *P. angustifolia* L., *P. annua* L., *P. pratensis* L., *Polypogon fugax* Nees ex Steud., *P. monspelinsis* (L.) Desf., *Rostraria cristata* (L.) Tzvelev., *Saccharum officinarum* L., *S. ravennae* (L.) Murray, *Secale cereale* L., *S. sylvestre* Host., *Setaria pumila* (Poir.) Roem.&Schult., *S. verticillata* (L.) Beauv., *S. viridis* (L.) Beauv., *Sorghum bicolor* (L.) Moench, *S. halepense* (L.) Pers., *S. vulgare* Pers., *Stipa capensis* Thunb., *Themeda triandra* Forssk., *Trisetum flavescens* (L.) Beauv., *T. koelerioides* Bornm.&Hack., *T. lineare* (Forks.) Boiss, *Triticum aestivum* L., *T. dicoccon* Schrank., *T. durum* Desf., *T. sativum* Lam., *T. spelta* L., *T. turanicum* Jakulz., *Vulpia geniculata* (L.) Link, *V. myuros* (L.) C.C. Gmel., *Zea mays* L.
Cyperecaea — *Carex distans* L., *Carex* sp.
Juncaceae — *Juncus acutiflorus* Ehrh ex Hoffm, *J. gerardii* Loisel, *Luzula* sp.
Caryophyllaceae — *Stellaria media* (L.) Vill.
Rutaceae — *Ptelea trifoliata*.

LIFE HISTORY: The species lives on upper sides of leaf blades near the bases sometimes on steams flower heads. Feeding on numerous species of grasses including in drier climates all the economically important cereal crops, occasionally on sedges or Juncaceae; attended by ants.

NOTES: Able to transmit cucumber mosaic *cucumovirus* and barley yellow dwarf *luteovirus*.

Sipha (Rungsia) praecocis **(Bozhko, 1959)**
(Figs 95, 162)

Rungsia praecocis BOZHKO, 1959: 21.

Diagnosis: Among other species of the subgenus can be distinguished by the small size of the body.

Redescription: apterous viviparous female (Fig. 95a): coloration of live specimens: yellowish white (BOZHKO 1959); pigmentation when mounted: yellowish. Body elongate, oval 1.55—1.65 mm long and 0.70—0.90 mm wide. Head about 0.22 mm long and 0.30 mm wide. Front of head slightly convex. Abdominal tergites without sculpture. Dorsal chaetotaxy: setae arranged in 3 rows: on margin of thorax and abdominal tergites I—VI 0.075—0.10 mm long, pleural and spinal ones 0.05—0.075 mm long, among them shorter, spiny hairs 0.025—0.035 mm long; on abdominal tergites VII—VIII 0.10—0.125 mm long. Head chaetotaxy: 2 rows of pointed hairs 0.075—0.10 mm long, among them shorter hairs 0.05—0.075 mm long. Antennae (Fig. 95b) reaching to middle of mesothorax, 0.36—0.39 times body length. Vb:Va 1.44—1.66; other antennal ratios: Vb:III 0.56—0.62, V:III 0.95—1.00, V:IV 2.44—2.66. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 1—3 hairs, segm. III with 3—4 hairs, segm. IV with 1 hair, Va with 0—1 hair. Antennal hairs about 0.05 mm long; the longest antennal hair III about 2.00 times basal articular diameter of this segment. ARS (Fig. 95c) about 0.075 mm long, 0.28—0.37 times antennal segment III and 0.43—0.50 times HT II. Furcula united by wide bridge. Legs short; first tarsal chaetotaxy 4:4:4 (Fig. 95d). Siphunculi slightly elevated, 0.03 mm in basal diameter. Cauda (Fig. 95e) 0.125 mm wide, with 3 pointed hairs 0.025—0.035 mm long.

Measurements of 1 specimen (in mm): (Streleckaya steppe, 17.06.1953, leg. Bozhko) body: 1.55, ant.: 0.57, ant. segm. (III—V): 0.20:0.075:(0.075+0.125), ARS: 0.075, HT II: 0.15.

Alate and sexuales: unknown.

Material examined: Type material: Holotype: Streleckaya steppe, 17.06.1953, leg. Bozhko, 1 apt. viv., no 140 (UASK).

Geographical Distribution (Map 23): Kazakhstan (Smailova 1978: 44), Ukraine (Streleckaya steppe, Kurskoy distr.: Bozhko 1959: 21).
A very local species, known only from few localities.

Map 23. *S. (R.) praecocis* — geographical distribution

Host Plant: *Carex praecox* Schreb.

Life History: The species lives in small colonies on upper sides of leaf blades.

Sipha (Rungsia) taurica **(Mamontova, 1959)**
(Figs 96, 163)

Rungsia taurica Mamontova, 1959: 71—73.

Shaposhnikov 1964: 544.

Diagnosis: This species can be distinguished by the big size of the body and dorsal hairs not arranged in visible rows.

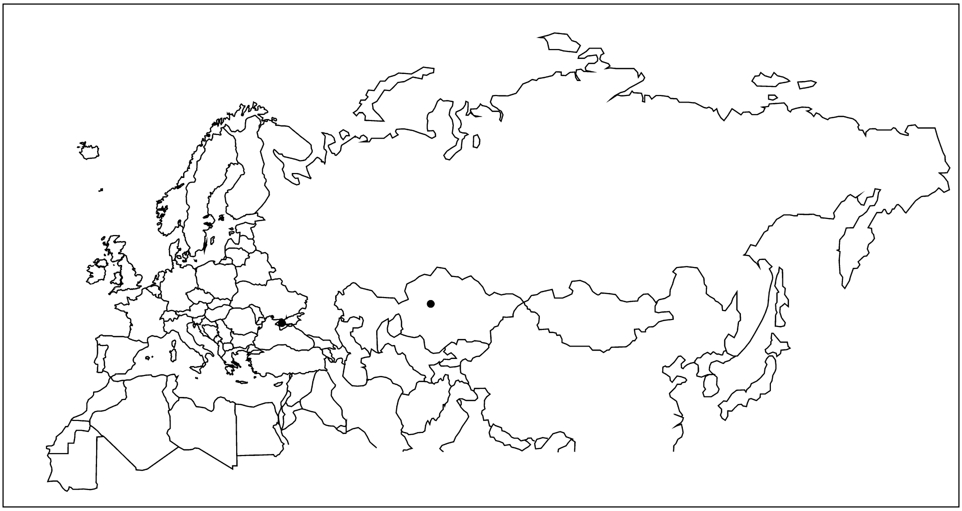
Redescription: apterous viviparous female (Fig. 96a): coloration of live specimens: lemon yellow (Mamontova 1959); pigmentation when mounted: yellowish. Body pear-shaped 1.80—2.40 mm long and 0.90—1.02 mm wide. Head about 0.30 mm long and 0.37 mm wide. Front of head slightly convex. Abdominal tergites without visible sculpture, with small, brownish intersegmental plates. Dorsal chaetotaxy: hairs pointed, not arranged in visible rows, on margin of tergites I—VI 0.09—0.10 mm long, across abdominal tergites 0.05—0.075 mm long; on tergites VII—VIII 0.12—0.15 mm long. Head chaetotaxy: pointed hairs 0.10—0.14 mm long on apex and margin of head; shorter hairs 0.075—0.09 mm long towards to mid of head. Antennae (Fig. 96b) reaching to mesothorax, 0.32—0.39 times body length. Vb:Va 1.25—2.50; other antennal ratios: Vb:III 0.55—0.82, V:III 0.84—1.00, V:IV 2.44—2.62. Antennal chaetotaxy: segm. I with 2—3 hairs, segm. II with 1—2 hairs, segm. III with 4—6 hairs, segm. IV with 1—2 hairs, Va with 0—1 hair. Antennal hairs about 0.04 mm long; the longest antennal hair III about 2.00 times basal articular diameter of this segment. ARS (Fig. 96c) about 0.10 mm long, 0.37—0.43 times antennal segment III and 0.55—0.58 times HT II. Furcula located on wide, stout base, usually weakly visible. Legs hairy; first tarsal chaetotaxy 5:5:5 (Fig. 96d). Siphunculi very short, slightly elevated 0.04 mm in basal diameter. Cauda (Fig. 96e) 0.12 mm wide, with 3 pointed hairs 0.09—0.10 mm long.

Measurements of 1 specimen (in mm): (Ukraine, Kercensky Pennisula, 1.07.1956, leg. Mamontova, no 1657, Holotype) body: 2.12, ant.: 0.70, ant. segm. (III—V): 0.23:0.09:(0.08+0.19), ARS: 0.10, HT II: 0.17.

Alate and sexuales: unknown.

Material examined: Type material: Holotype: Kercensky Pennisula, 1.07.1956, leg. Mamontova, 3 apt. viv., no 1657 (UASK).
Other material: 3 apt. viv. from Krym, Ukraine (BMNH), (MNHN).

Geographical Distribution (Map 24): Kazakhstan (Central Kazakhstan: Smailova 1971: 21); Ukraine (Krymska distr. Kerczensky Pennisula: Mamontova 1959: 73, Krym: Shaposhnikov 1964: 544).
A very local species, known only from few localities.



Map 24. *S. (R.) taurica* — geographical distribution

Host Plant: *Leymus racemosus* (Lam.) Tzvel.
Life History: The species lives on underside of leaves.

Sipha (Rungsia) uvarovi Mordvilko, 1921
(Figs 97, 164)

Sipha uvarovi Mordvilko, 1921: 56.

Mamontova 1959: 34; Shaposhnikov 1964: 544; Ivanovskaja 1977: 242, 243.

Diagnosis: This species is similar to *S. (R.) praecocis* but differs from it by longer apical segment of rostrum and shorter antennae.

Redescription: apterous viviparous female (Fig. 97a): coloration of live specimens: grayish green to dark green (Mordvilko 1921; Ivanovskaja 1977); pigmentation when mounted: yellowish. Body ellipsoidal 1.50—1.75 mm long and about 0.90 mm wide. Head about 0.20 mm long and 0.32 mm wide. Front of head almost flat. Abdominal tergites without visible sculpture. Dorsal chaetotaxy: hairs not arranged in visible rows, on margin of thorax and abdominal tergites 0.075—0.10 mm long, across abdominal tergites

0.05—0.075 mm long. Head chaetotaxy: pointed hairs 0.10—0.125 mm long on apex of head; shorter hairs 0.05—0.075 mm long towards to mid of head. Antennae (Fig. 97b) reaching to posterior margin of mesothorax, 0.28—0.36 times body length. Vb:Va 1.22—1.42; other antennal ratios: Vb:III 0.61—0.66, V:III 1.11—1.13, V:IV 2.42—2.85. Antennal chaetotaxy: segm. I with 2 hairs, segm. II with 2 hairs, segm. III with 4—5 hairs, segm. IV with 1 hair, Va with 1 hair. Antennal hairs about 0.05 mm long; the longest antennal hair III about 1.66 times basal articular diameter of this segment. ARS (Fig. 97c) about 0.15 mm long, as long as antennal segment III and HT II. Furcula weakly visible. Legs hairy; first tarsal chaetotaxy 5:5:5 (Fig. 97d). Siphunculi short, slightly elevated, 0.03 mm in basal diameter. Cauda (Fig. 97e) 0.12 mm wide.

Measurements of 1 specimen (in mm): (Russia, 3.07.1930, Holotype) body: 1.75, ant.: 0.49, ant. segm. (III—V): 0.15:0.07:(0.07+0.10), ARS: 0.15, HT II: 0.14.

Alate and sexuales: unknown.

Material examined: Type material: Holotype: Russia, 3.07.1930, 2 apt. viv., 3 juv. (ZMAS).

Geographical Distribution (Map 25): Kazakhstan (Juchnevitsh 1968: 69, Central Kazakhstan: Smailova 1971: 21), Russia (Mordvilko 1929: 91, West Siberia: Ivanovskaja 1976: 179, Kuybyshev, Kulunda, Slavgorod, Altay: 1977: 242—243), Ukraine (Mamontova 1959: 69, Beregove: 1963: 29).
Local species known from localities in Ukraine and Central Asia.

Map 25. *S. (R.) uvarovi* — geographical distribution

Host Plant: *Agropyron* sp., *Festuca ovina* L., *Poa* sp., *Triticum aestivum* L.

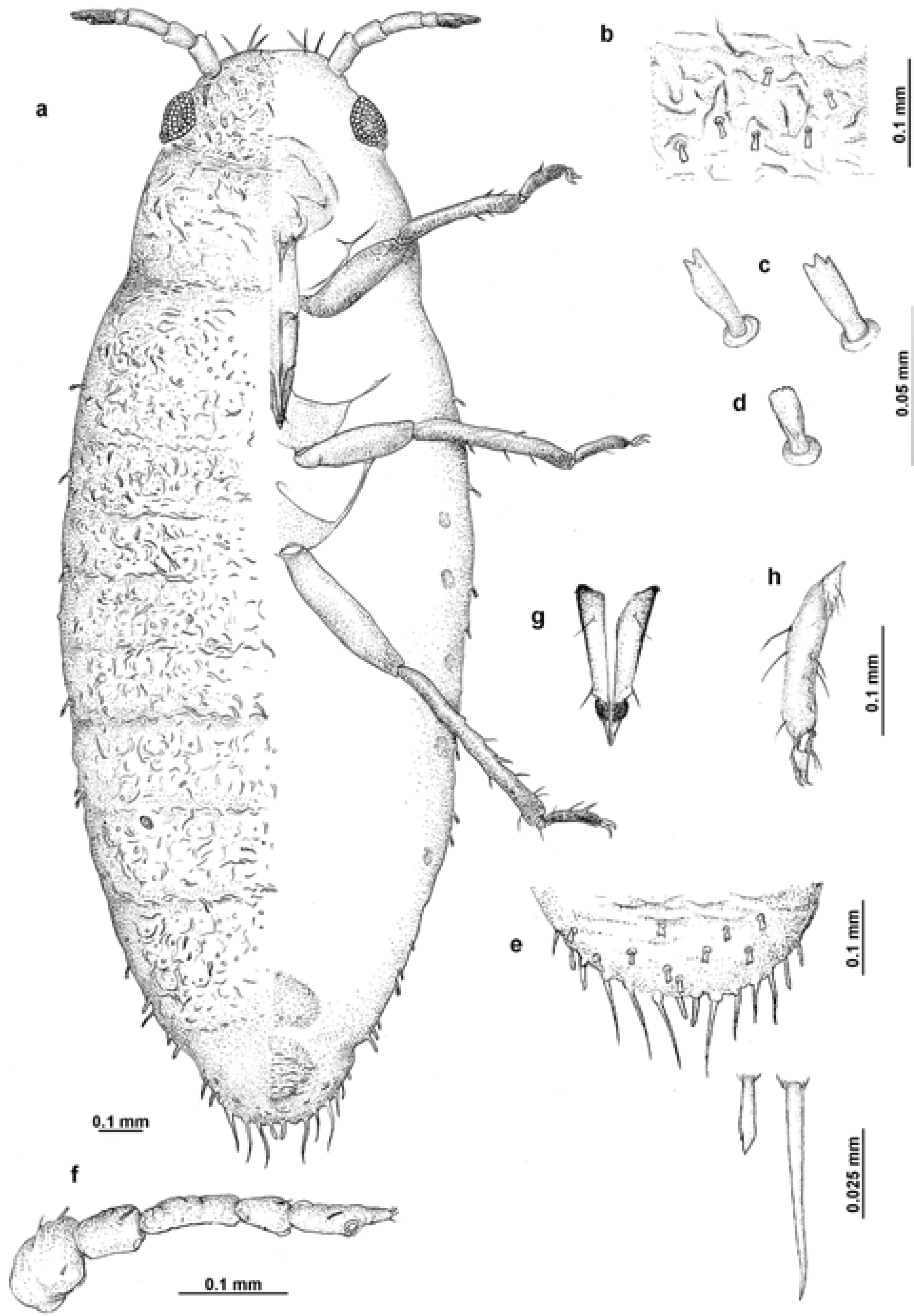


Fig. 30. *A. brevicornis* — apterous viviparous female:
a — general feature, **b** — sculpture, **c** — marginal hairs of abdominal tergites VI—VII, **d** — fan-shaped hairs of abdominal tergites, **e** — abdominal tergite VIII with middle short, spatulate and long, pointed hairs, **f** — antenna, **g** — apical segment of rostrum, **h** — hind tarsus

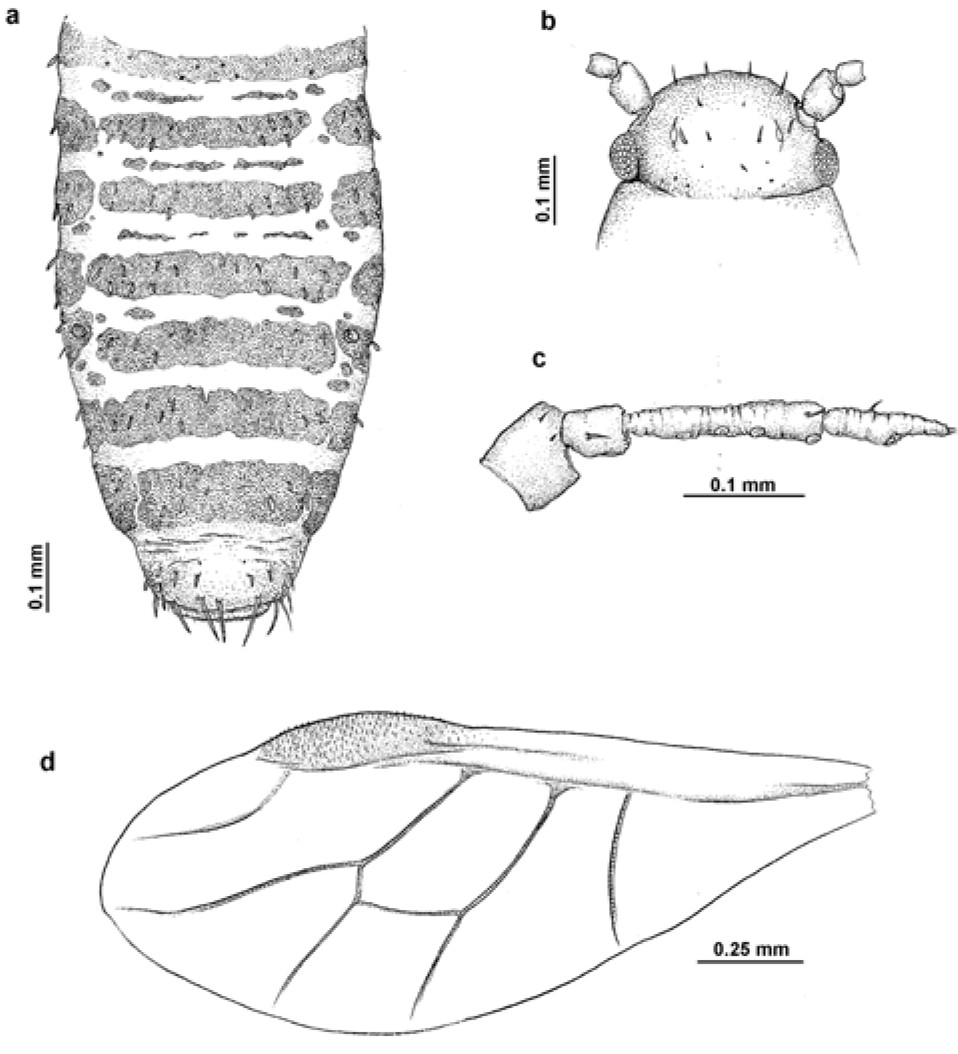


Fig. 31. *A. brevicornis* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

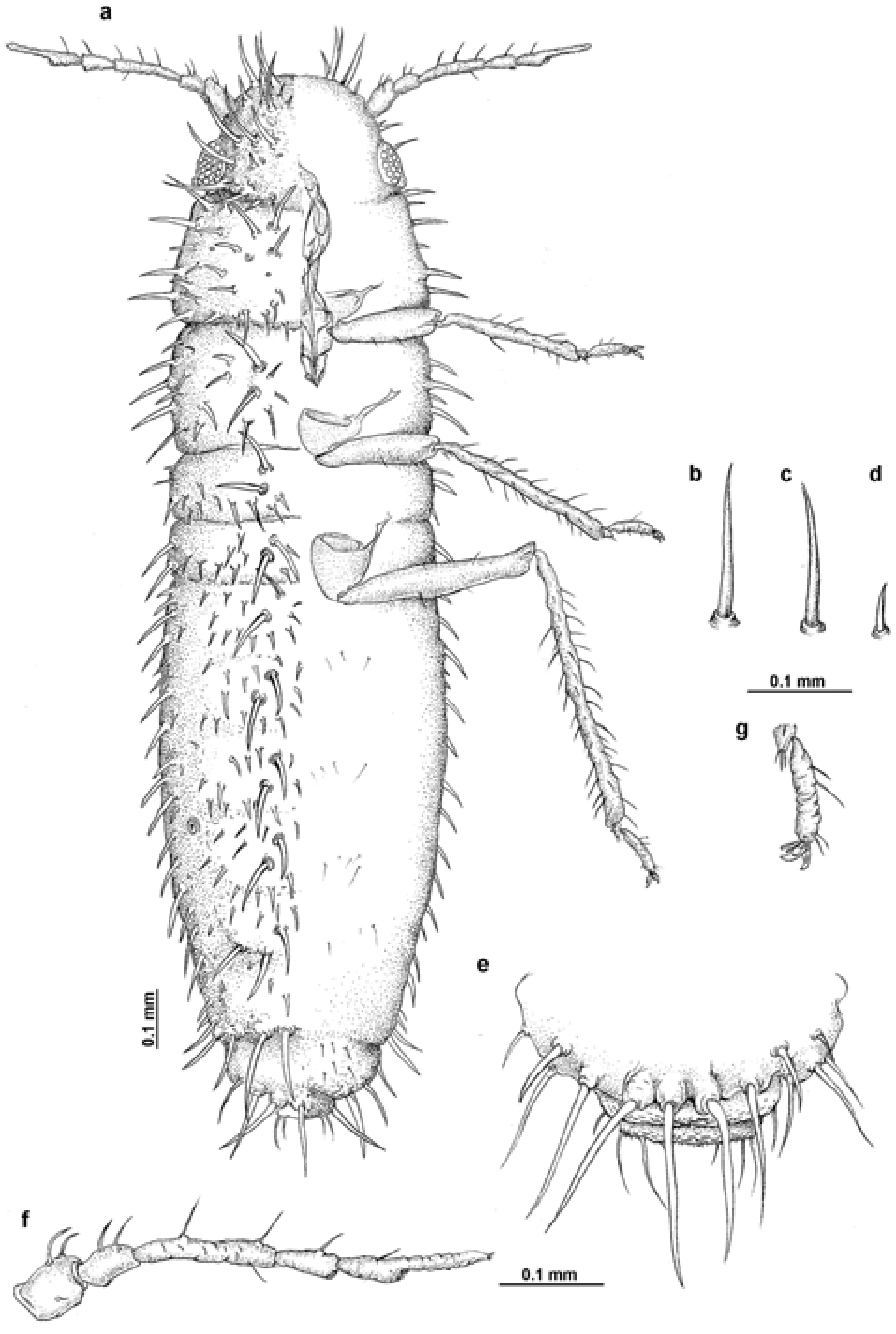


Fig. 32. *A. doncasteri* — apterous viviparous female:
a — general feature, **b** — spinal, **c** — marginal, **d** — spiny hairs of abdominal tergites, **e** — abdominal tergite VIII, **f** — antenna, **g** — hind tarsus

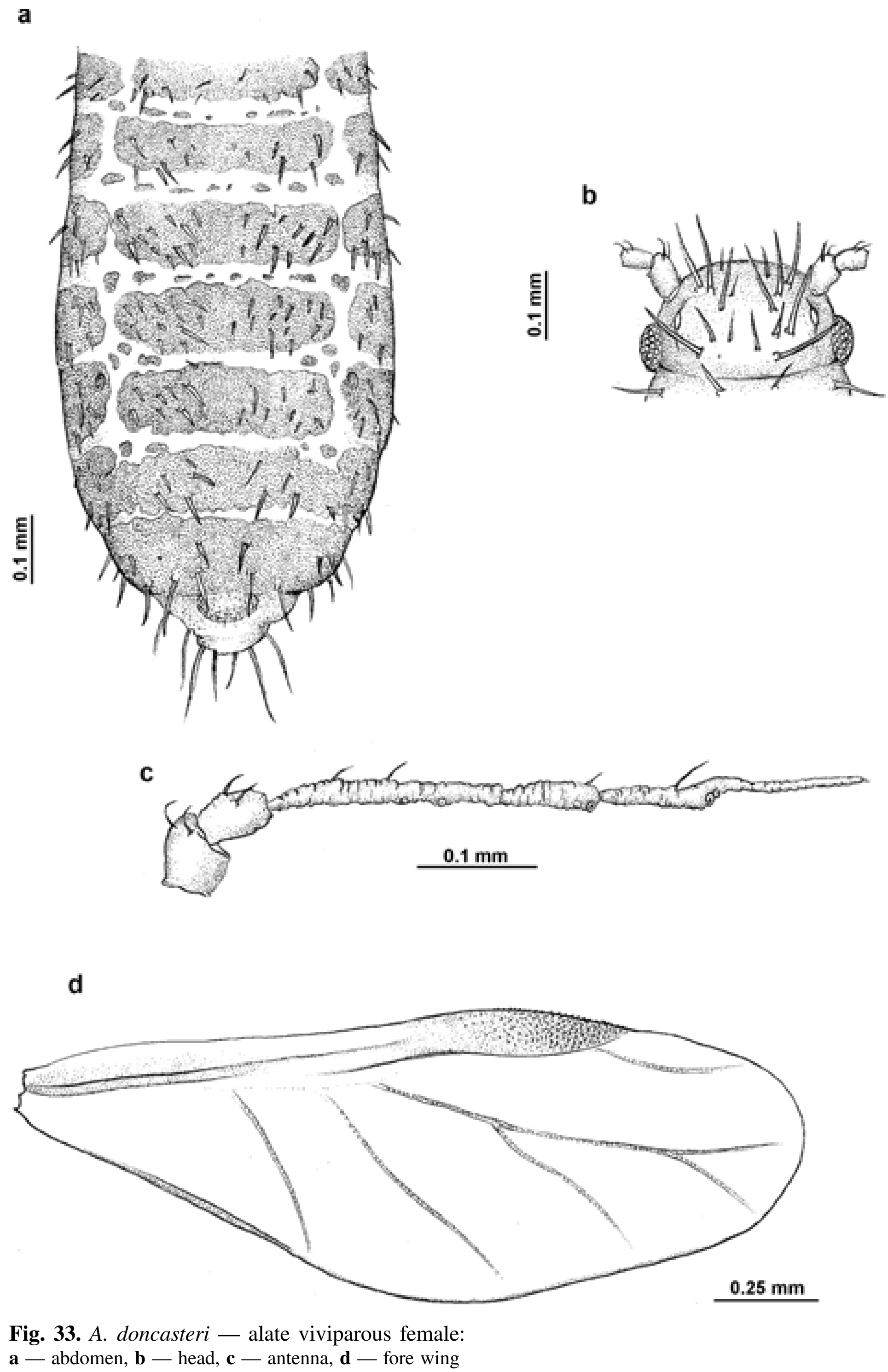


Fig. 33. *A. doncasteri* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

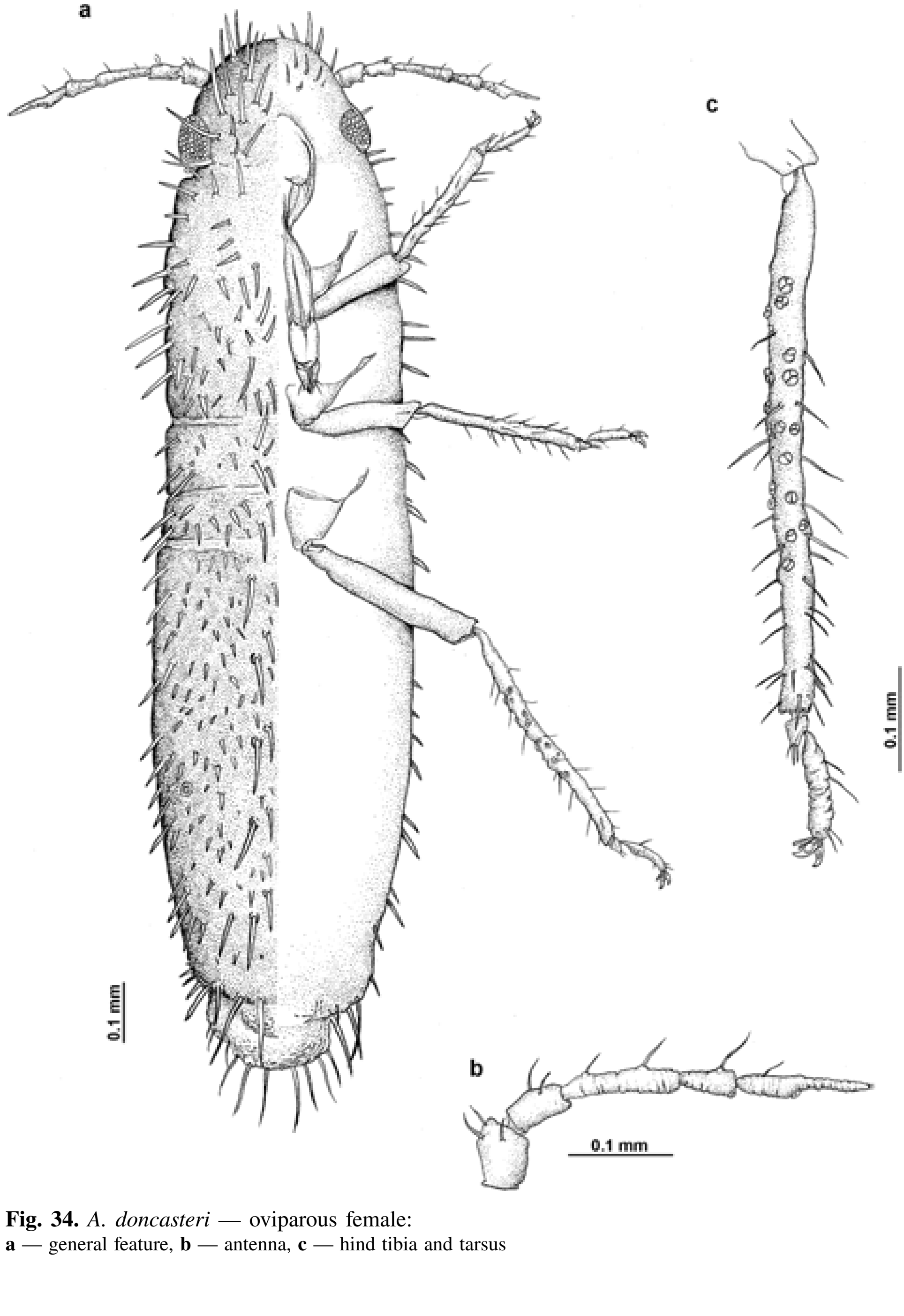


Fig. 34. *A. doncasteri* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

d

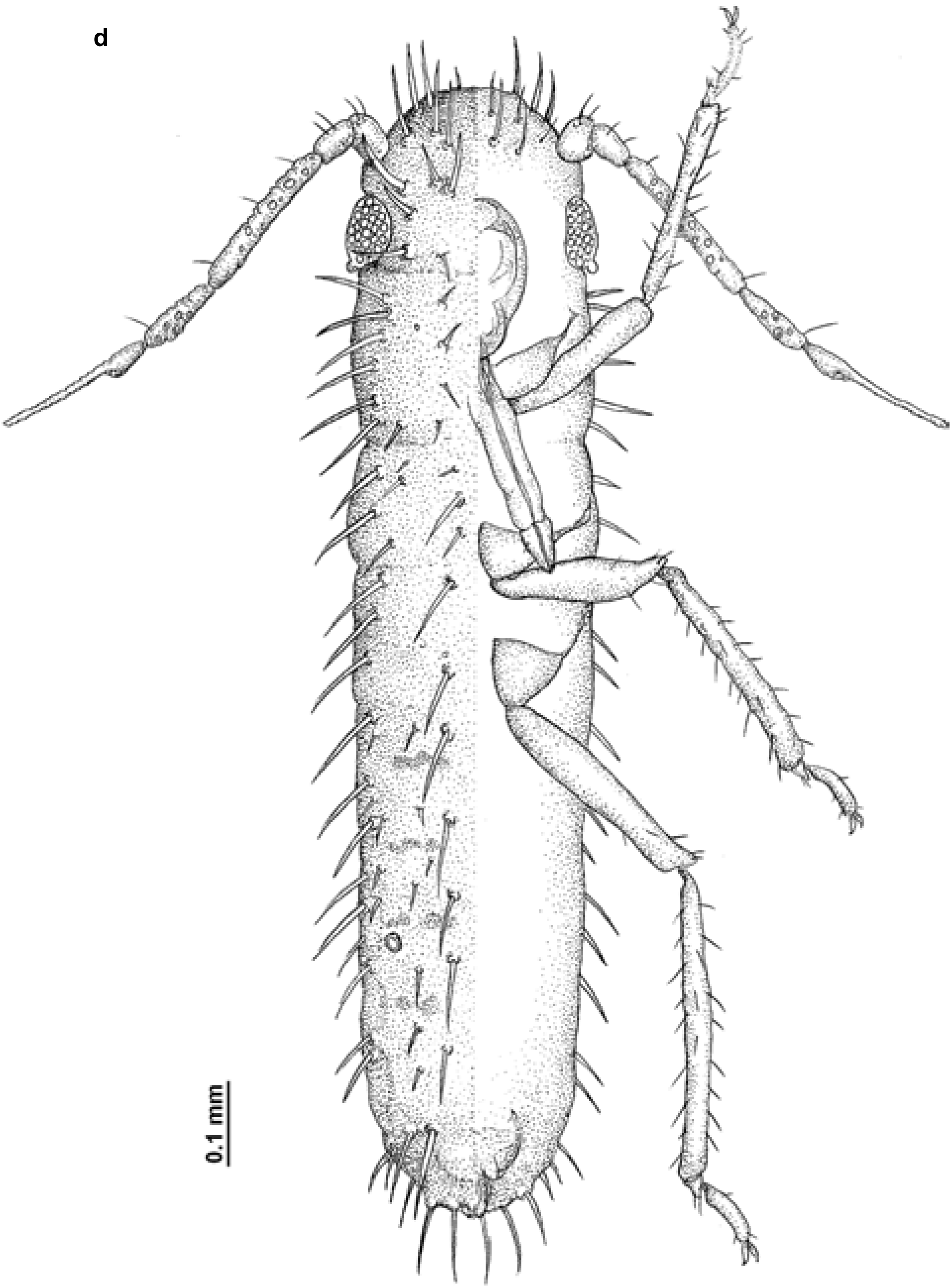


Fig. 34d. *A doncasteri* — general feature

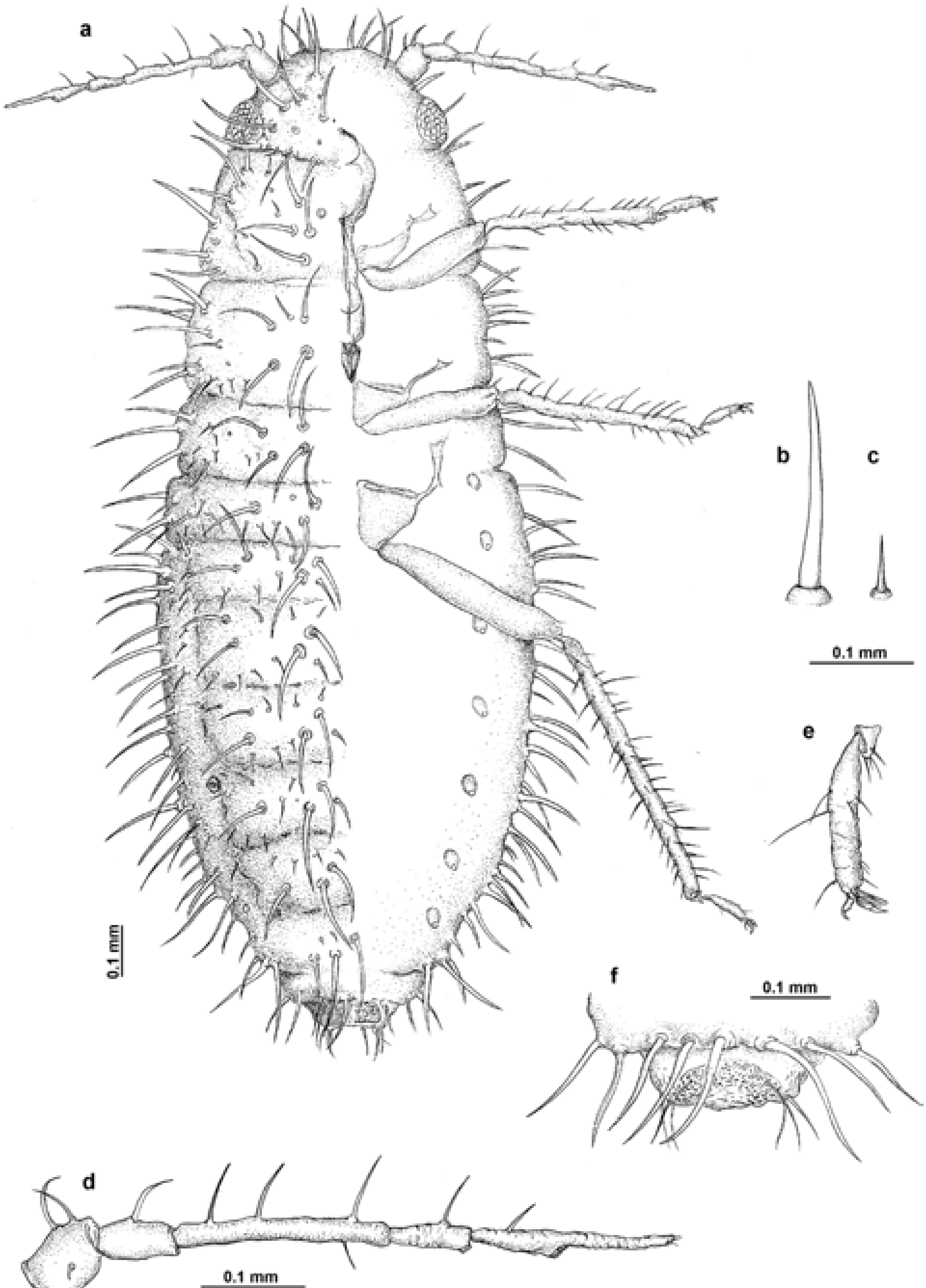


Fig. 35. *A. hirtellus* — apterous viviparous female:
a — general feature, **b** — marginal hairs of abdominal tergites, **c** — spiny hairs of abdominal tergites, **d** — antenna, **e** — hind tarsus, **f** — abdominal tergite VIII and cauda

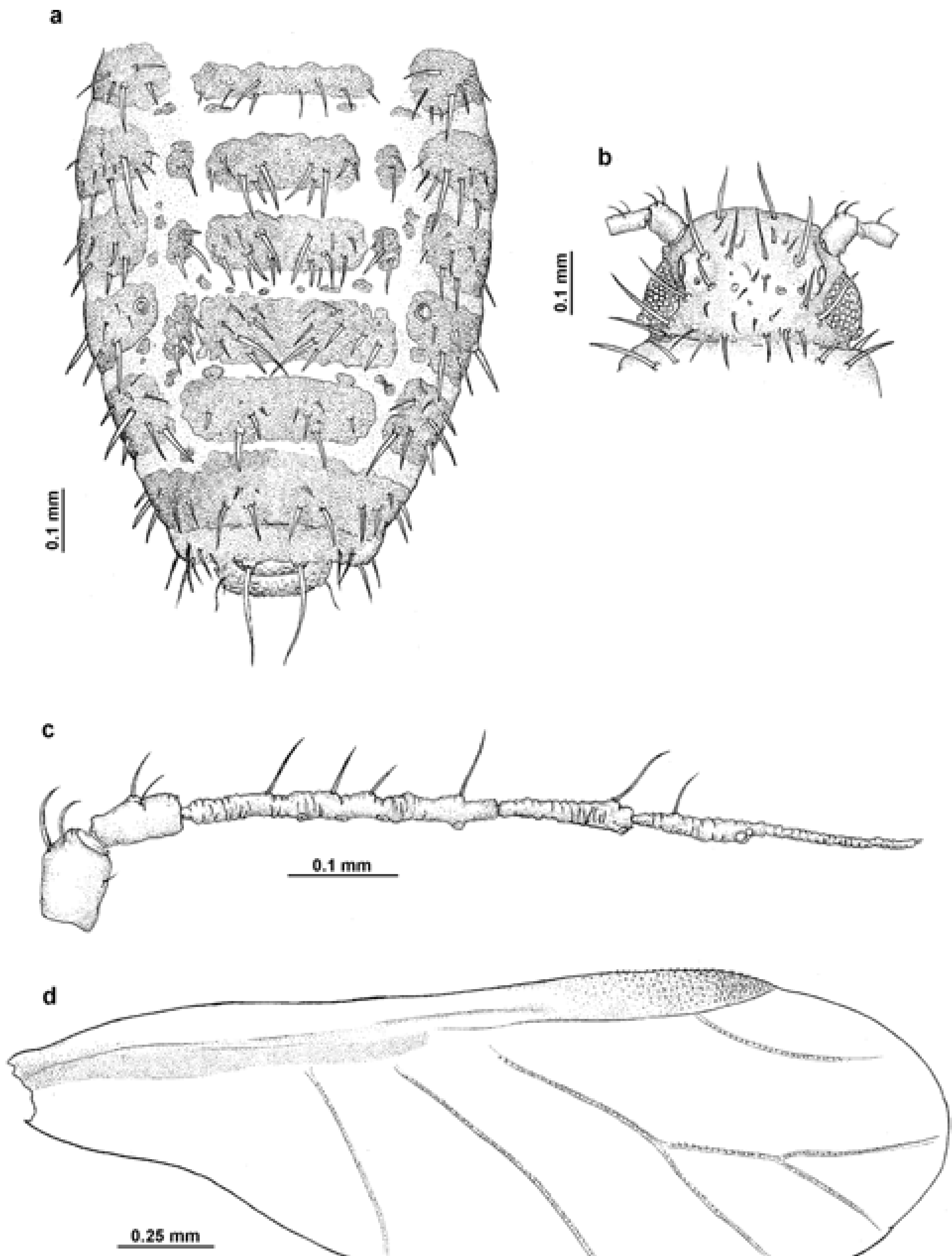


Fig. 36. *A. hirtellus* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

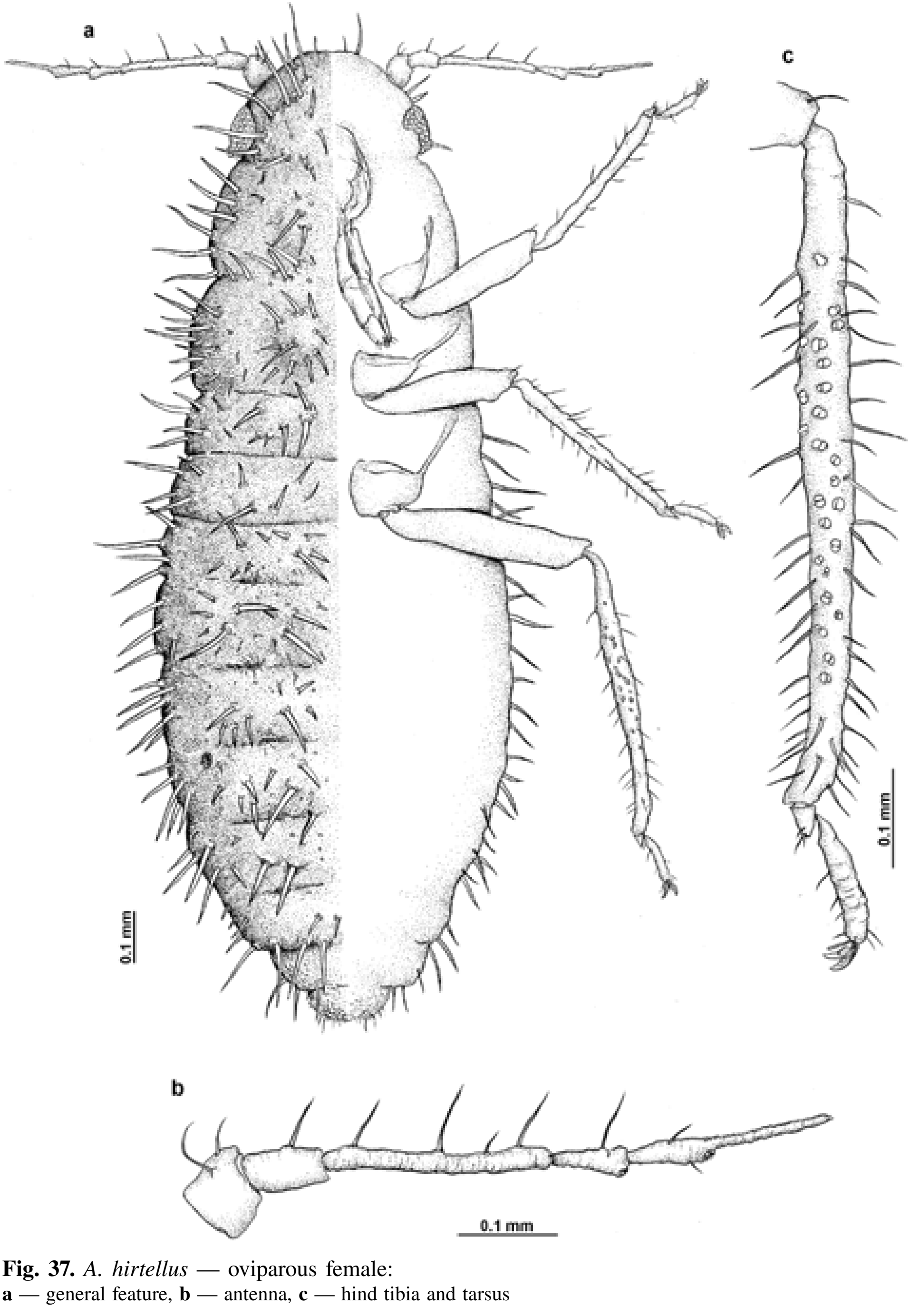


Fig. 37. *A. hirtellus* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

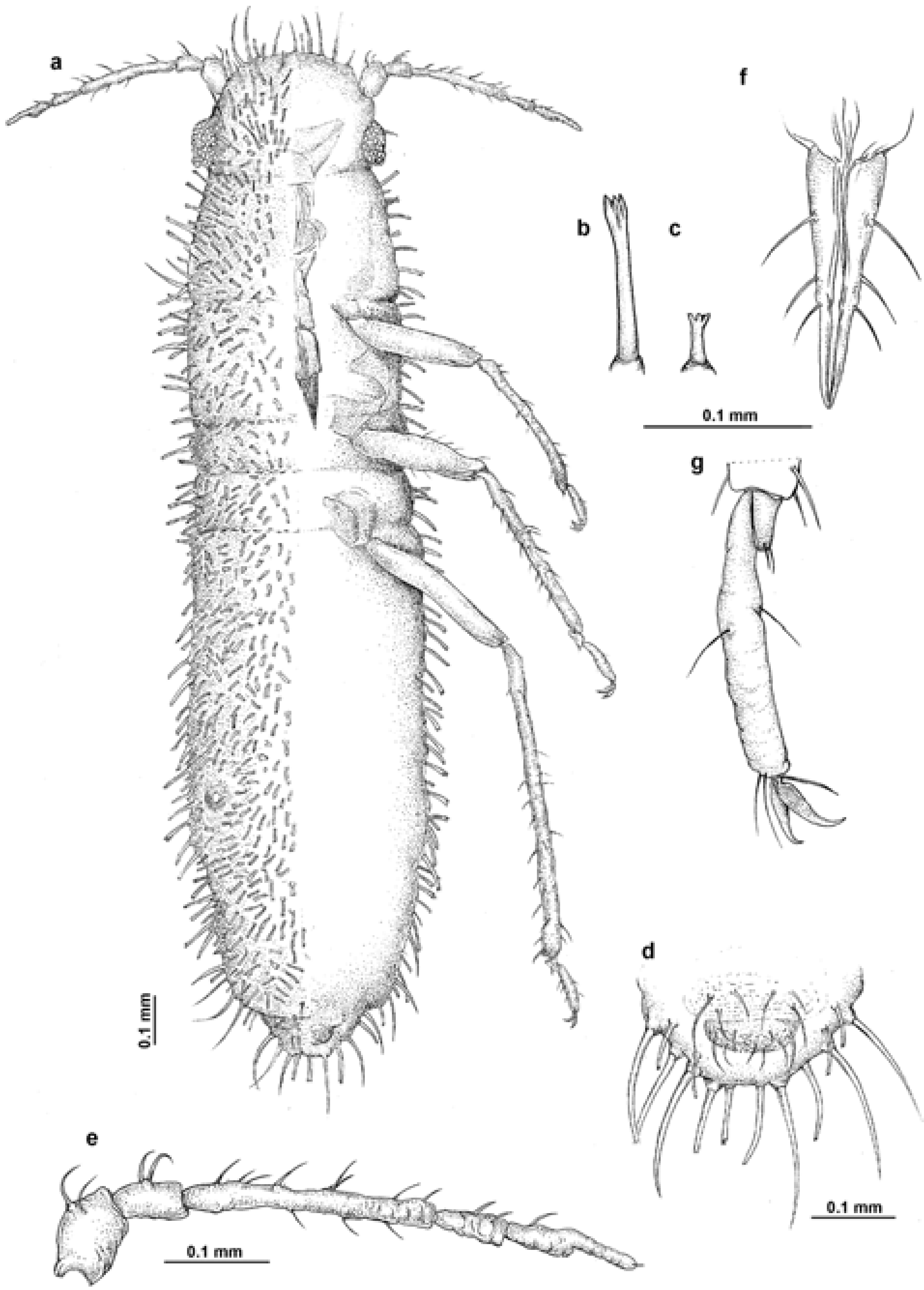


Fig. 38. *A. karakumi* — apterous viviparous female:
a — general feature, **b** — jagged marginal hair of thorax and abdominal tergites I—V, **c** — fan-shaped hairs of abdominal tergites, **d** — abdominal tergite VIII, **e** — antenna, **f** — apical segment of rostrum, **g** — hind tarsus

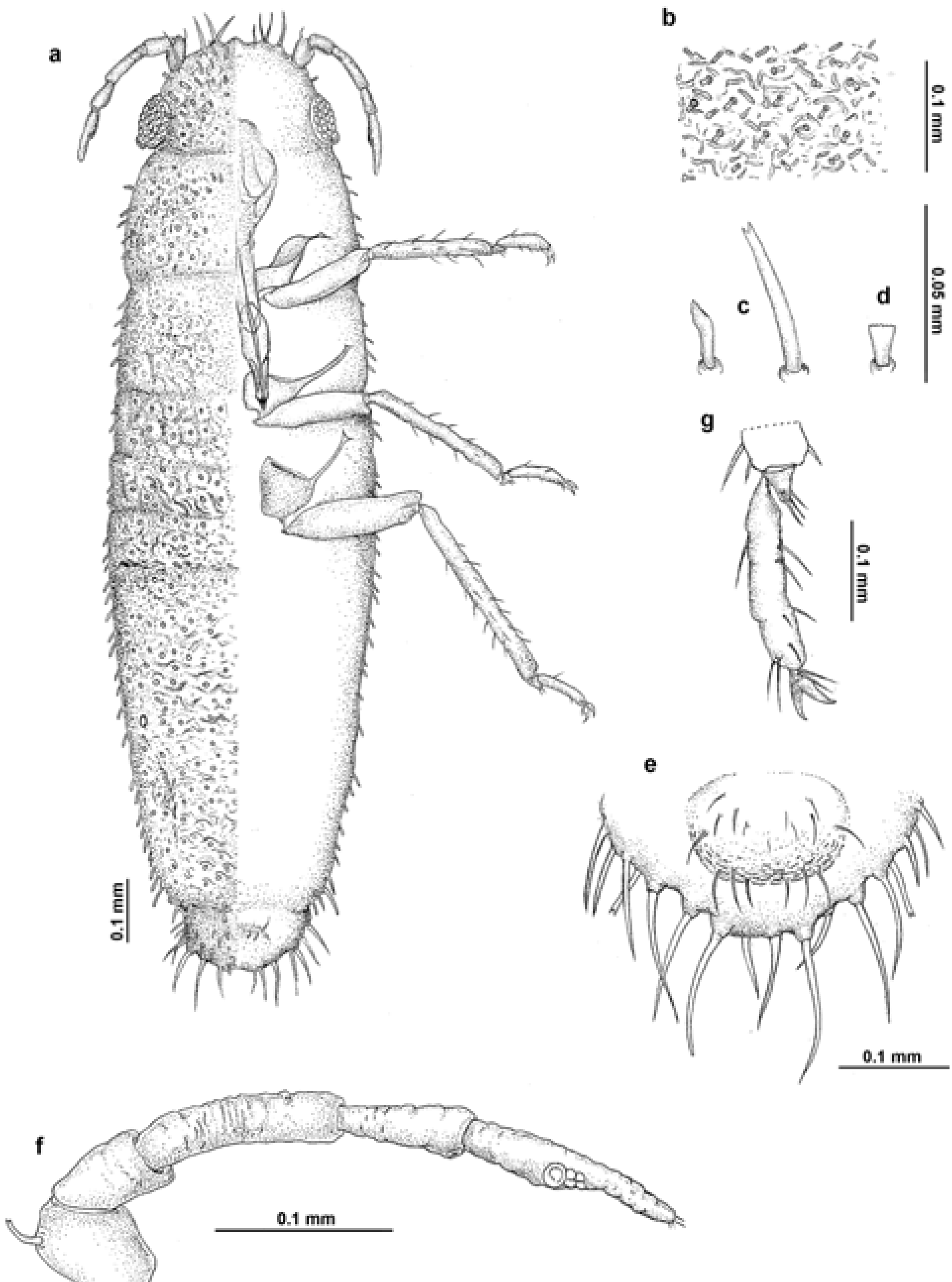


Fig. 39. *A. persianus* — apterous viviparous female:
a — general feature, **b** — sculpture, **c** — marginal hairs of abdominal tergites VI—VII, **d** — fan-shaped hairs of abdominal tergites, **e** — abdominal tergite VIII, **f** — antenna, **g** — hind tarsus

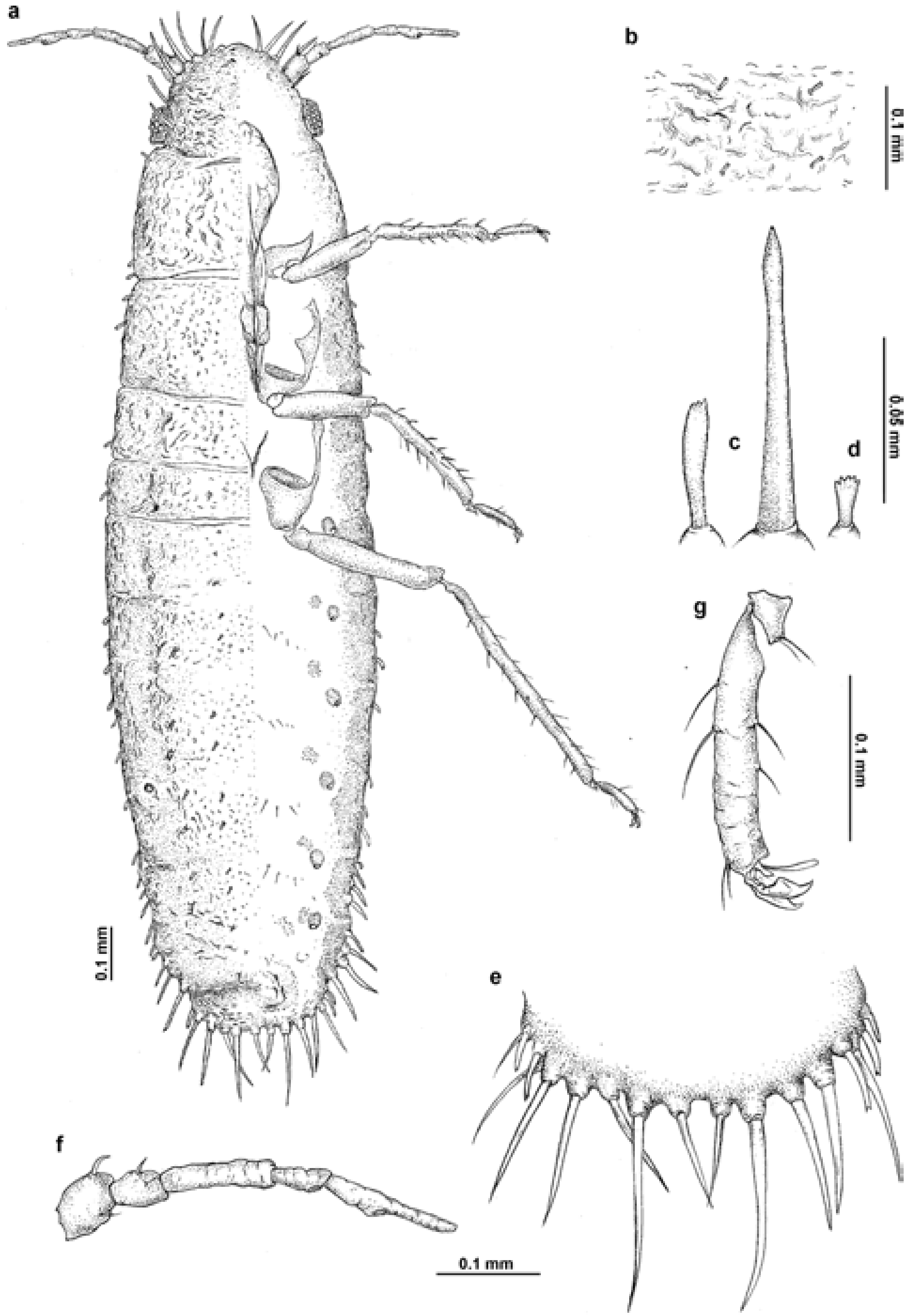


Fig. 40. *A. serrulatus* — apterous viviparous female:
a — general feature, **b** — sculpture, **c** — marginal hairs of abdominal tergites VI—VII, **d** — pleural and spinal hairs of abdominal tergites, **e** — abdominal tergite VIII, **f** — antenna, **g** — hind tarsus

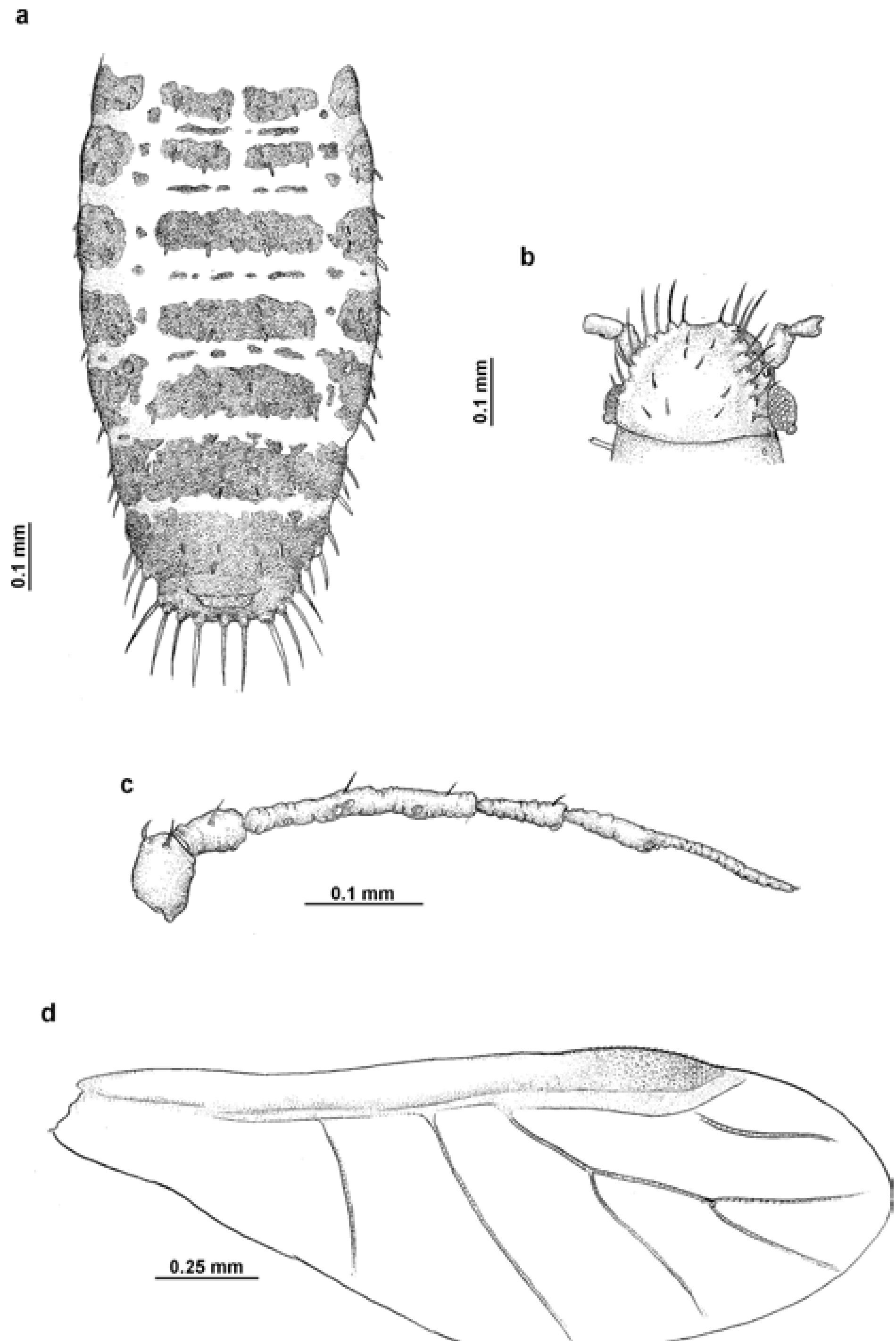


Fig. 41. *A. serrulatus* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

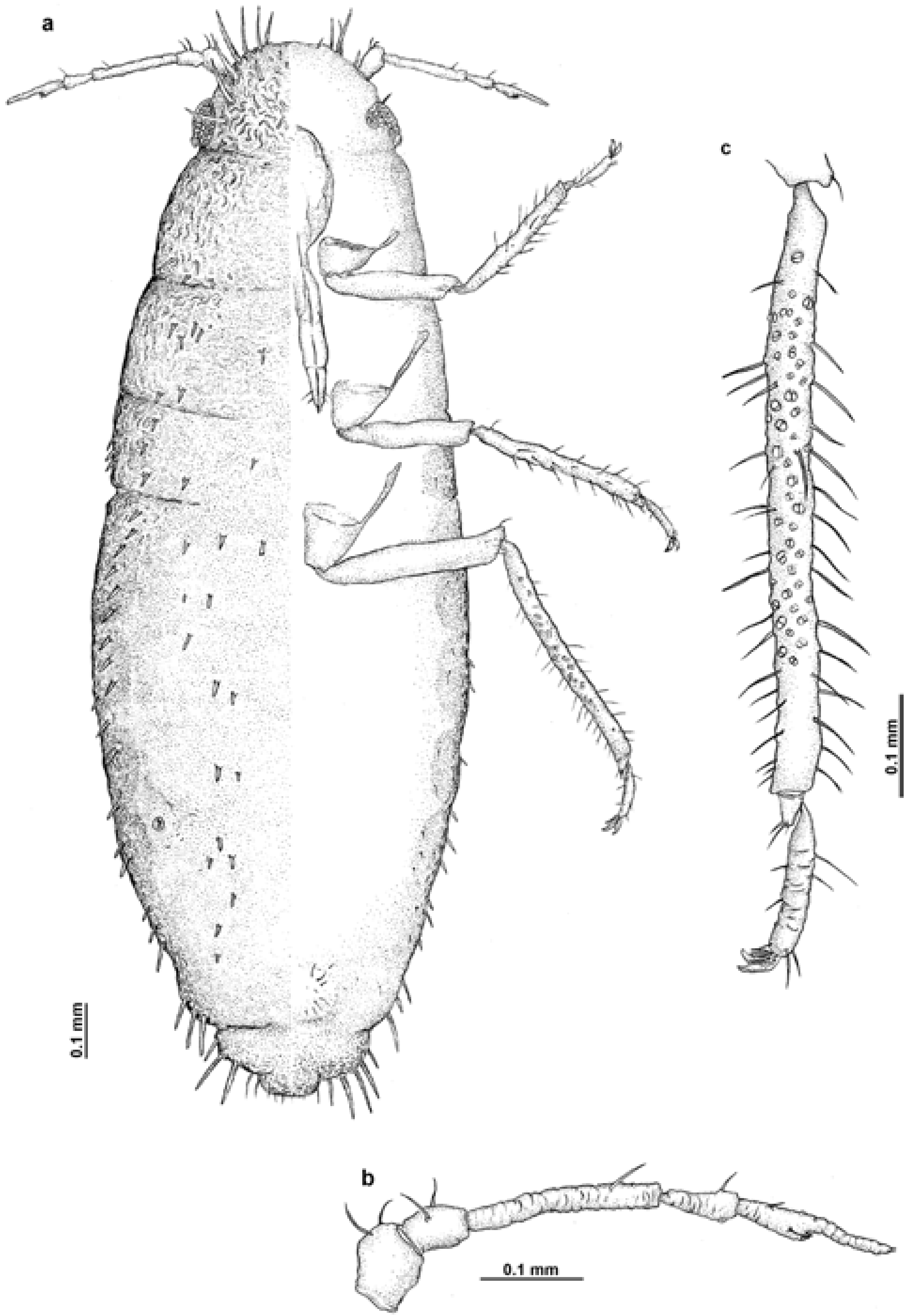


Fig. 42. *A. serrulatus* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

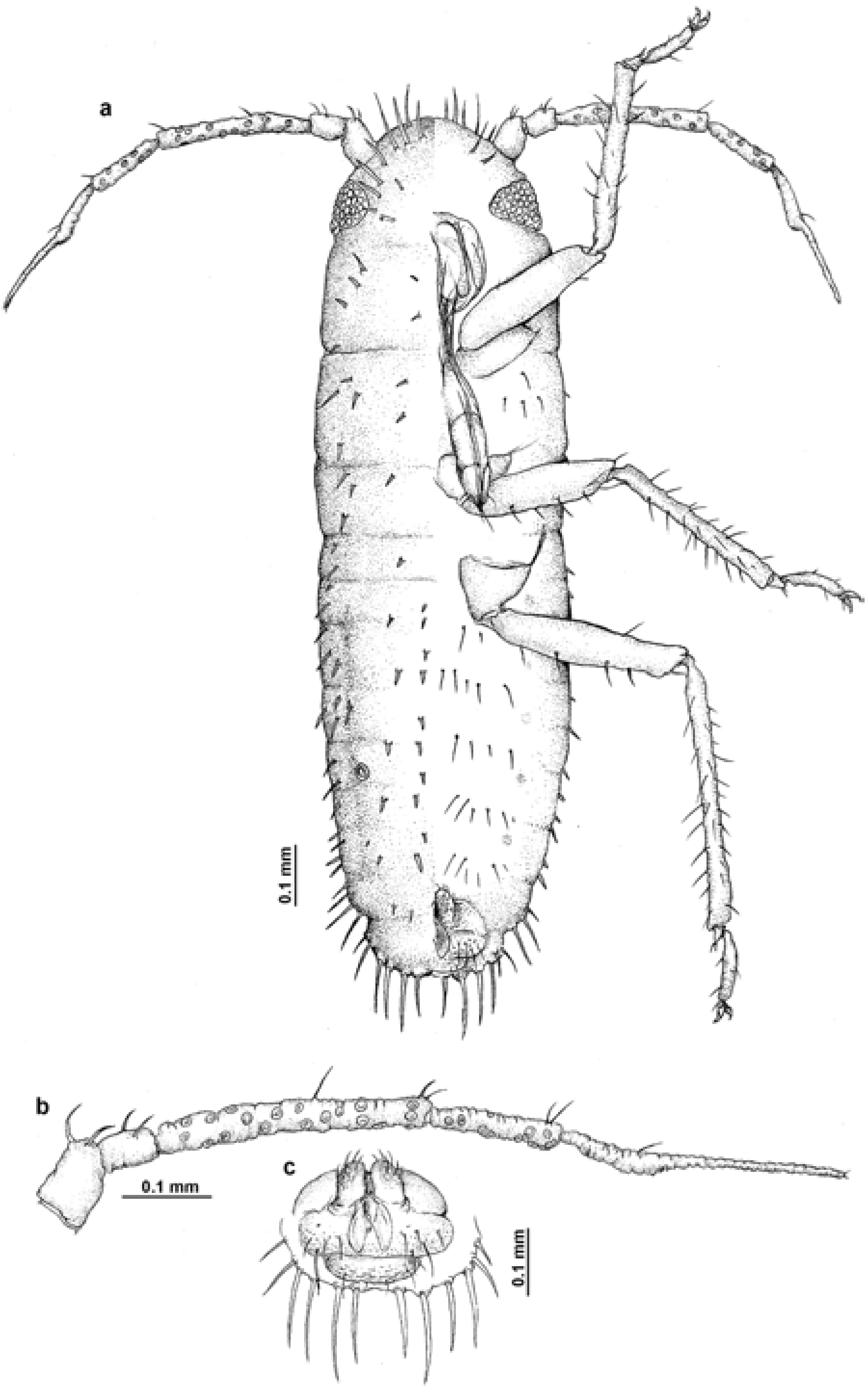


Fig. 43. *A. serrulatus* — male:
a — general feature, **b** — antenna, **c** — genitalia

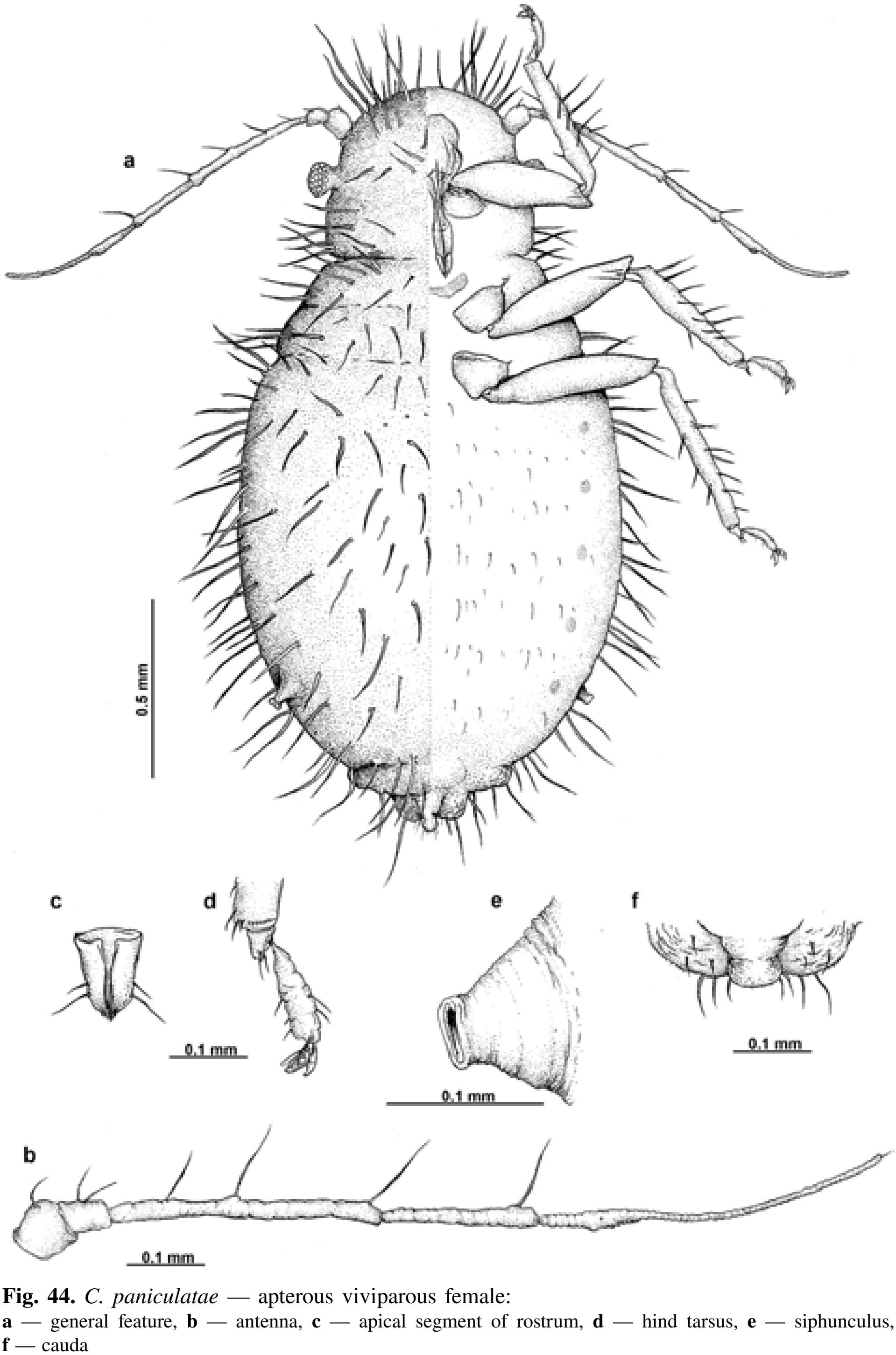


Fig. 44. *C. paniculatae* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — siphunculus, **f** — cauda

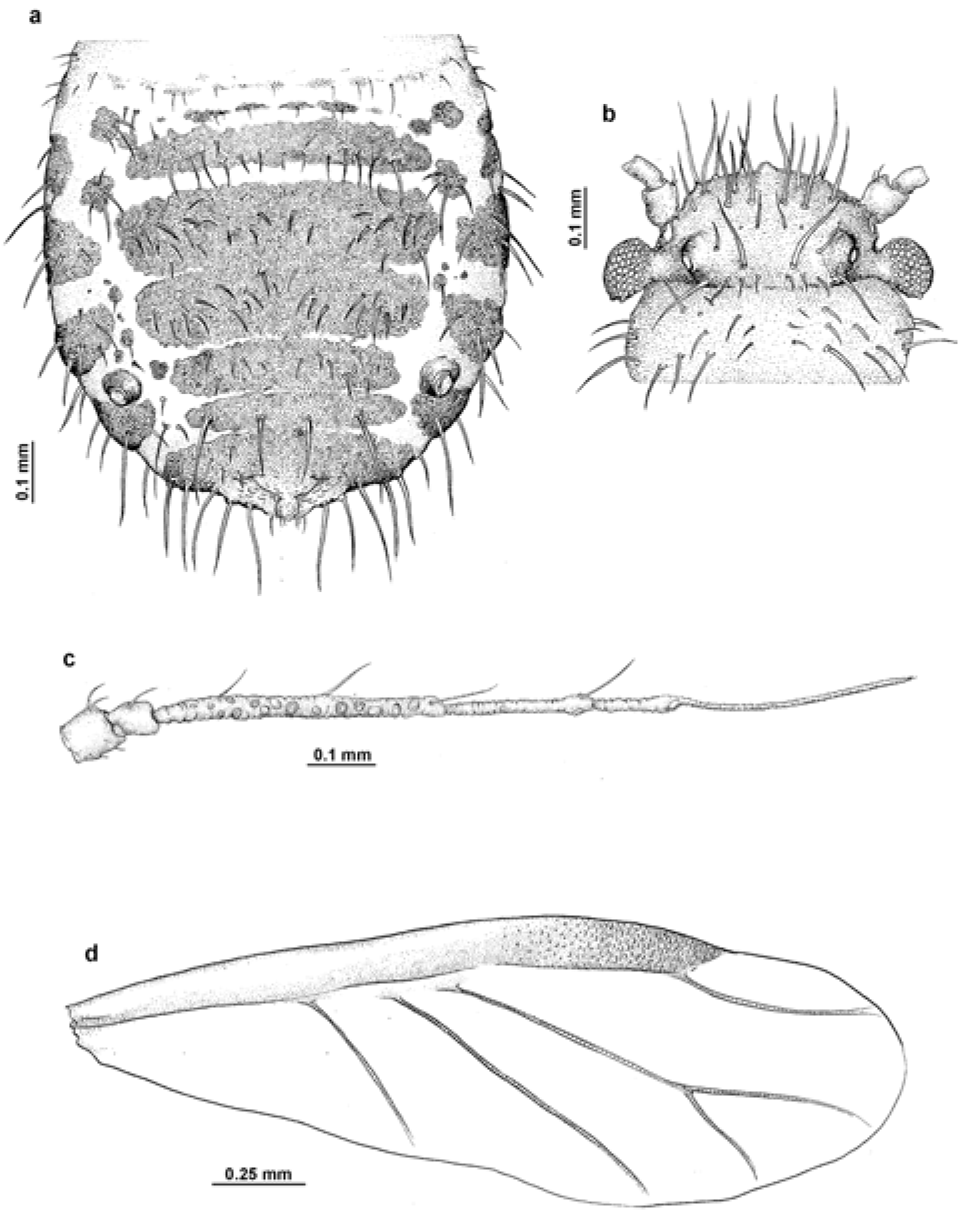


Fig. 45. *C. paniculatae* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

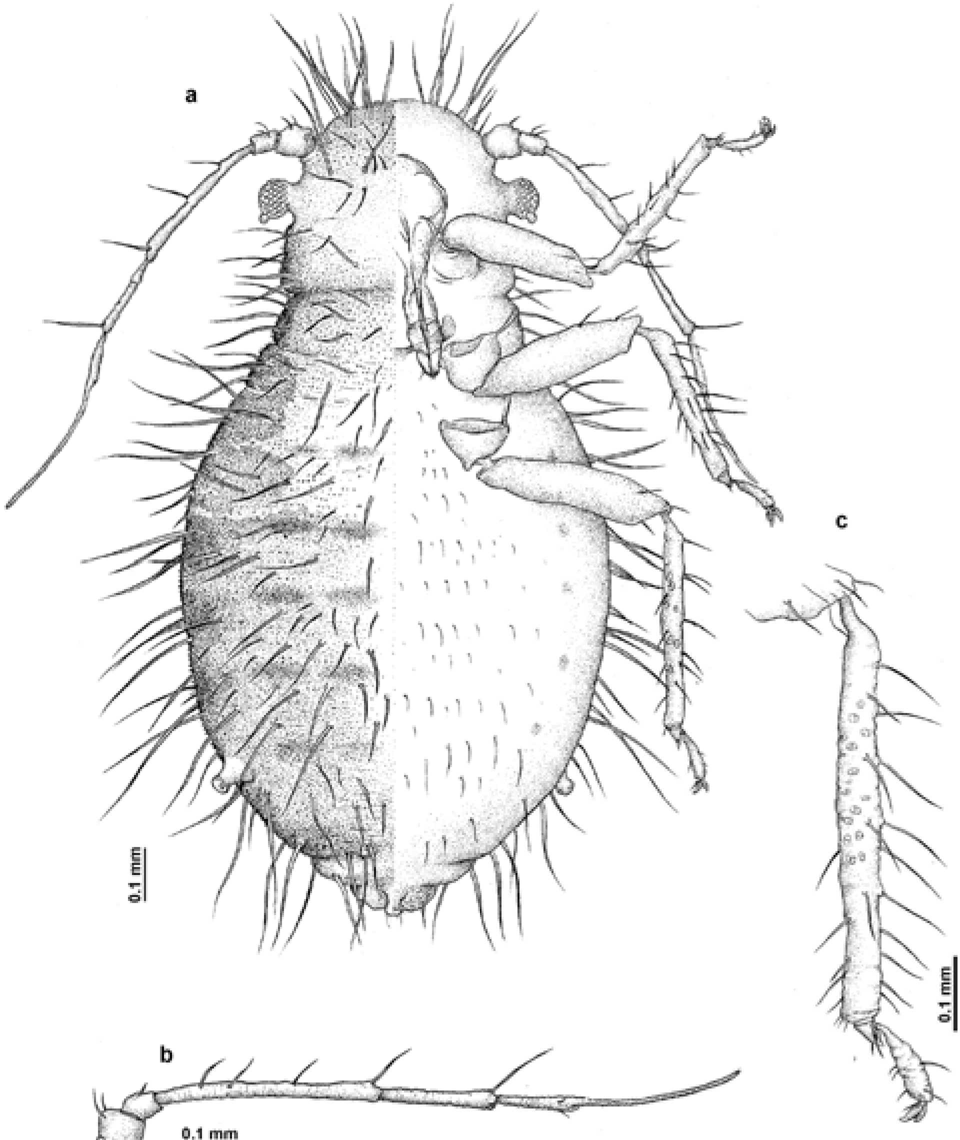


Fig. 46. *C. paniculatae* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

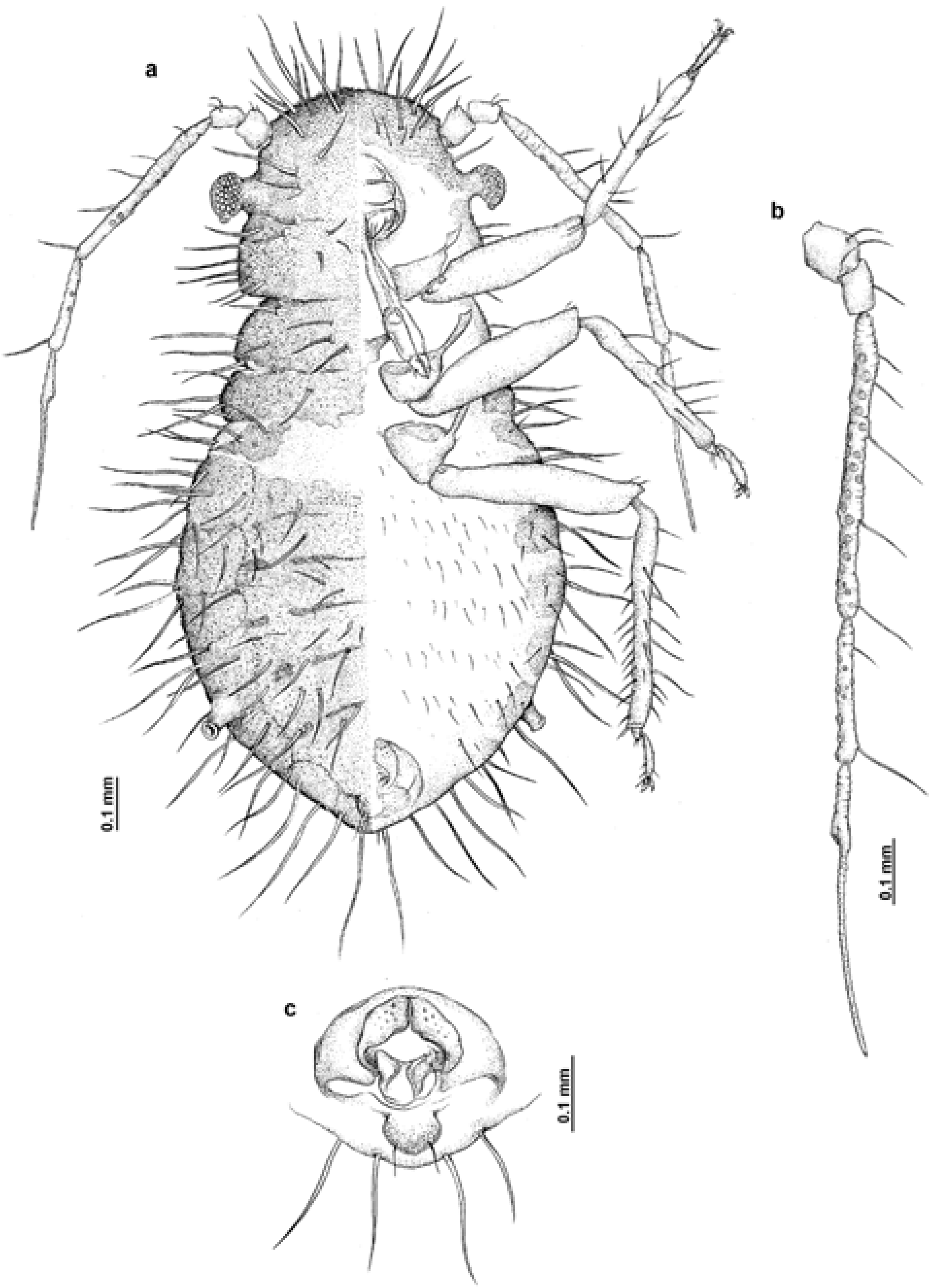


Fig. 47. *C. paniculatae* — male:
a — general feature, **b** — antenna, **c** — genitalia

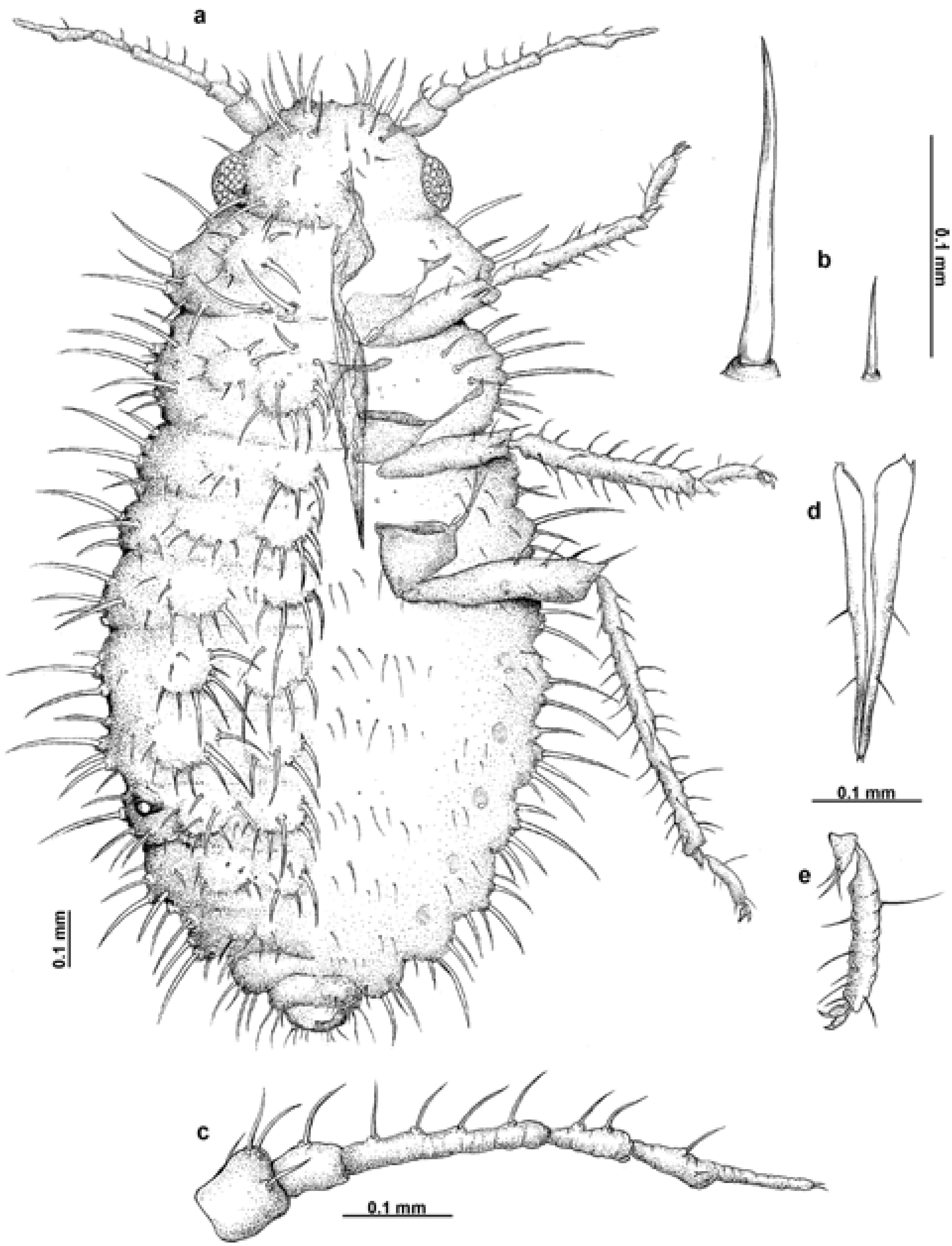


Fig. 48. *Ch. berlesei* — apterous viviparous female:
a — general feature, **b** — dorsal hairs, **c** — antenna, **d** — apical segment of rostrum, **e** — hind tarsus

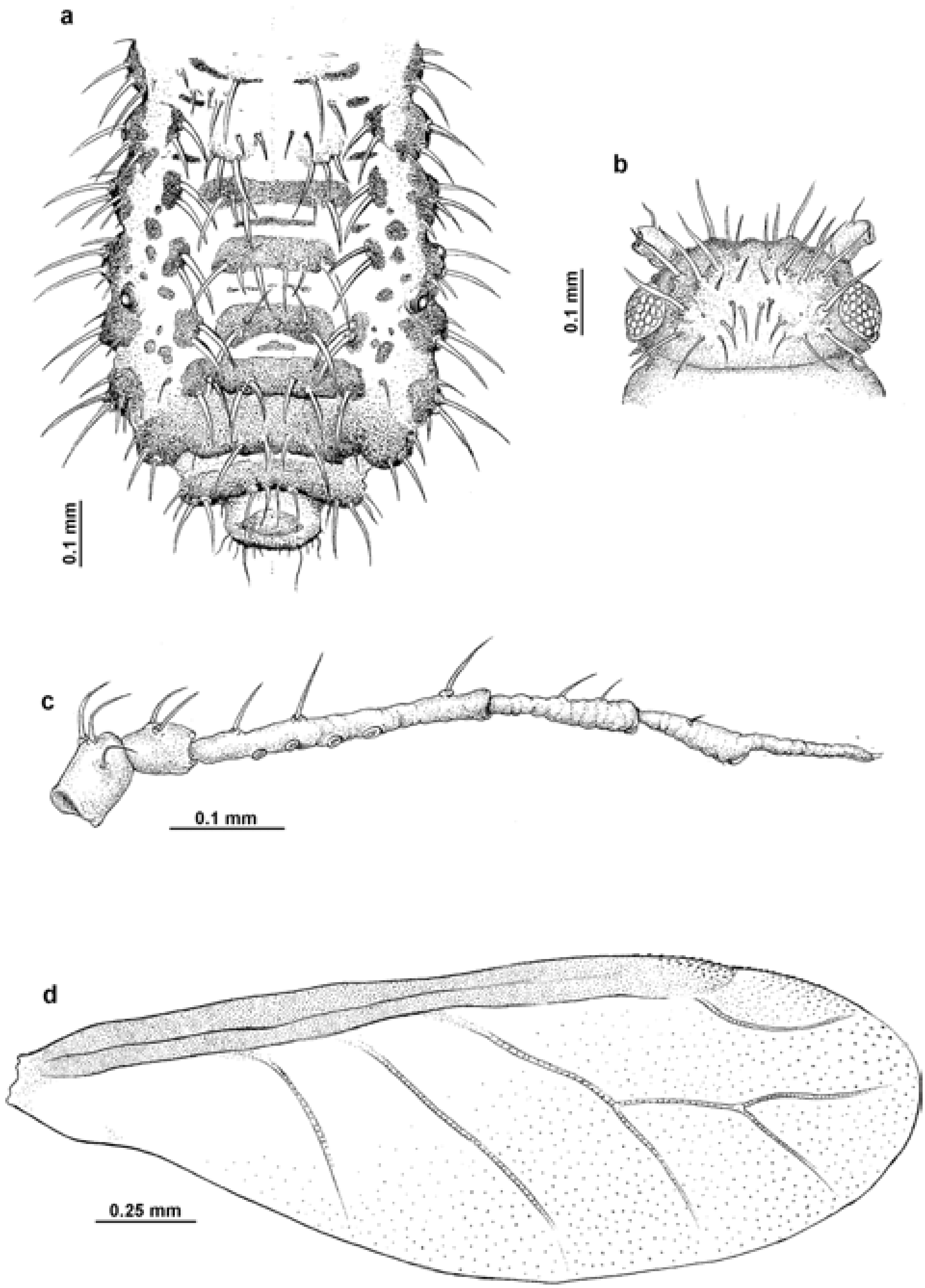


Fig. 49. *Ch. berlesei* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

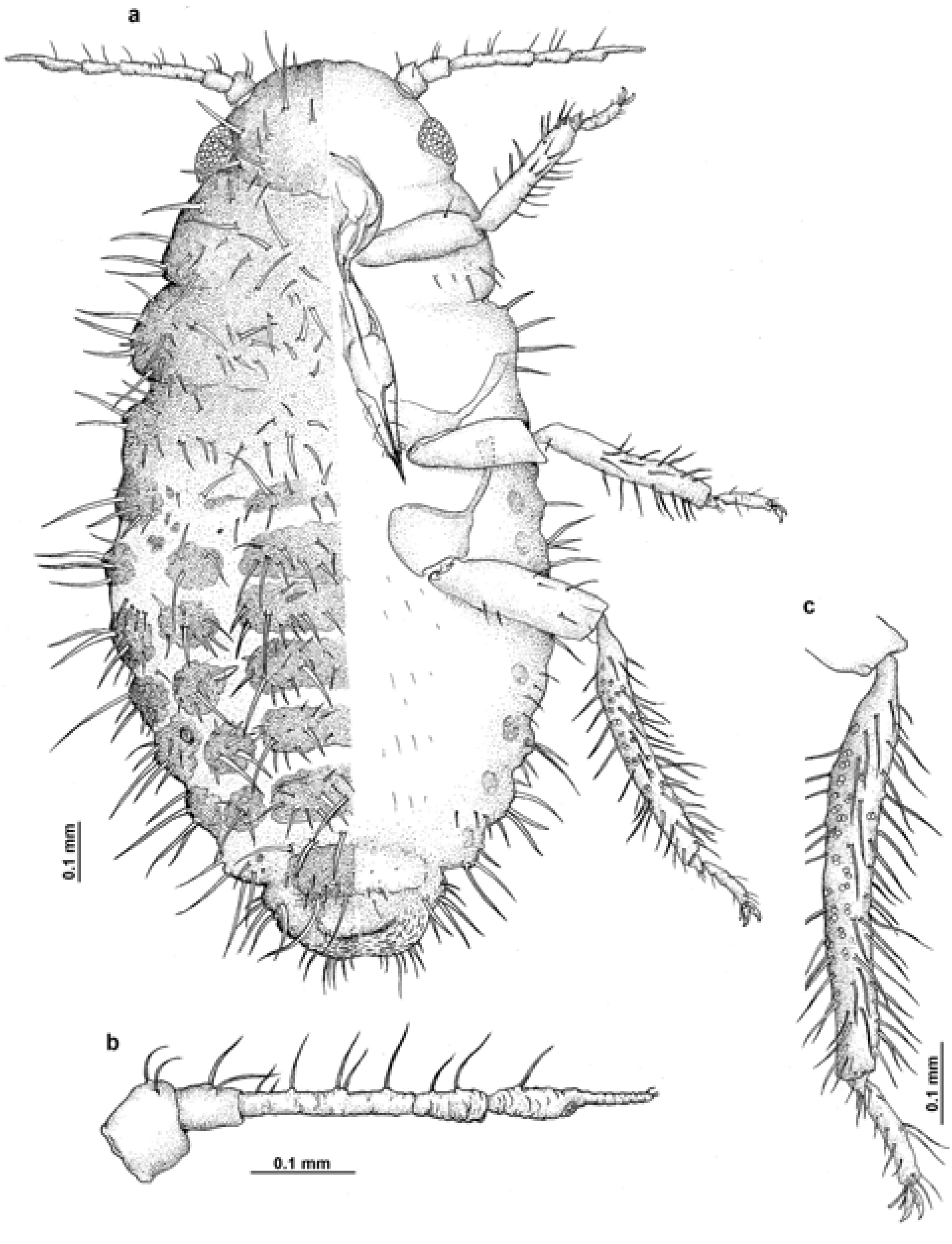


Fig. 50. *Ch. berlesei* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

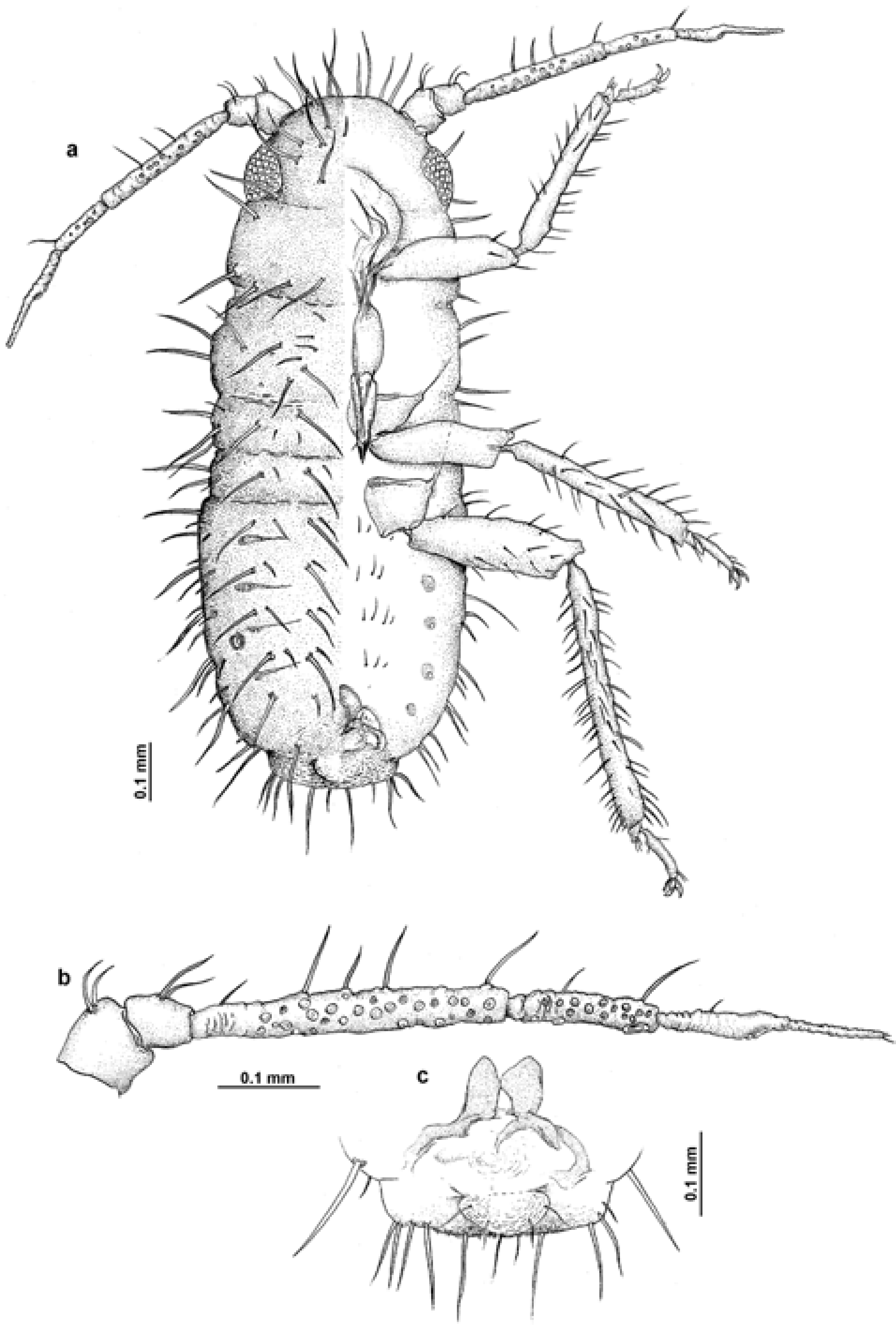


Fig. 51. *Ch. berlesei* — male:
a — general feature, **b** — antenna, **c** — genitalia

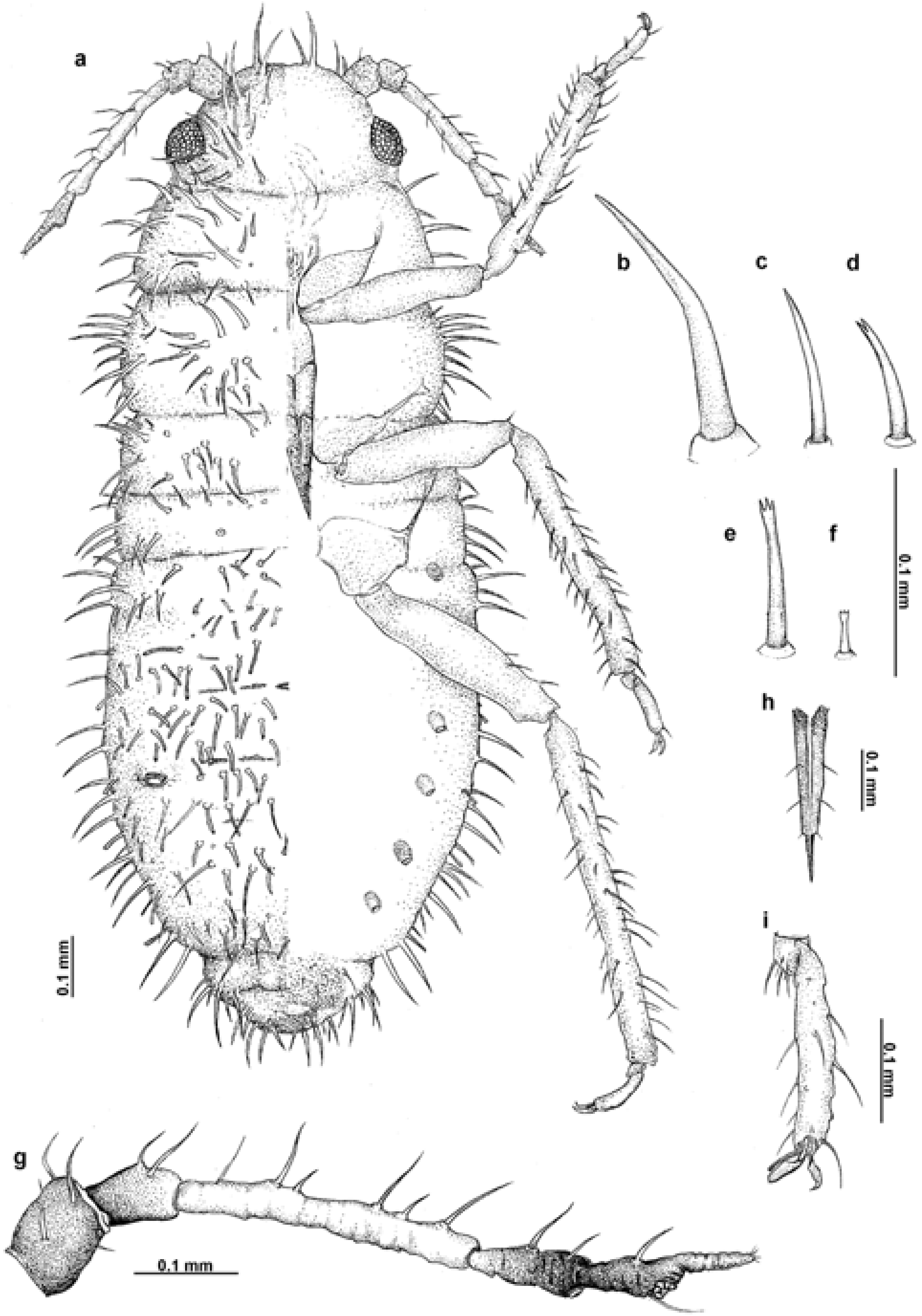


Fig. 52. *Ch. longirostris* — apterous viviparous female:
a — general feature, **b**—**d** — marginal hairs of thorax and abdominal tergites, **e**, **f** — hairs across the abdominal tergites I—VII, **g** — antenna, **h** — apical segment of rostrum, **i** — hind tarsus

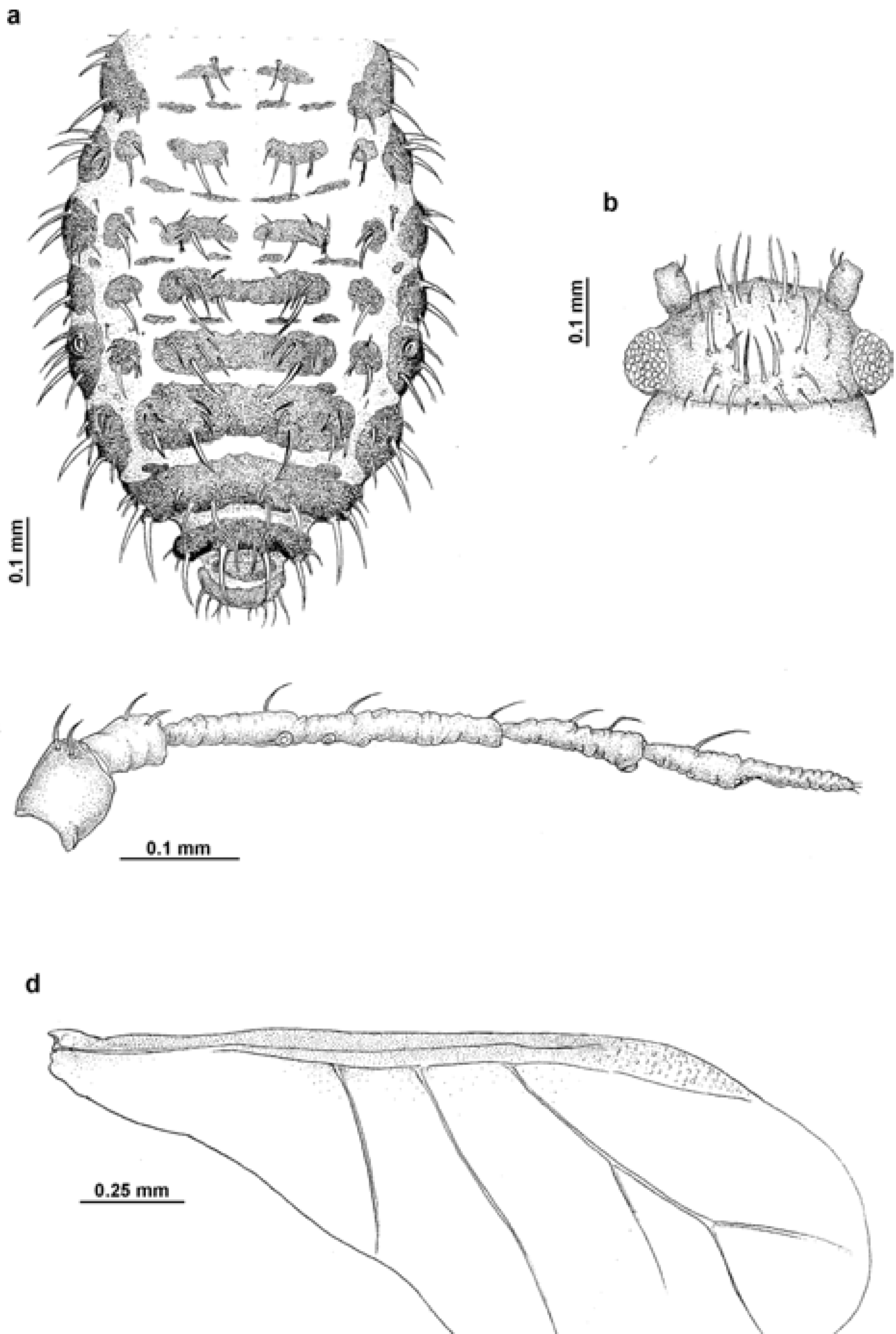


Fig. 53. *Ch. longirostris* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

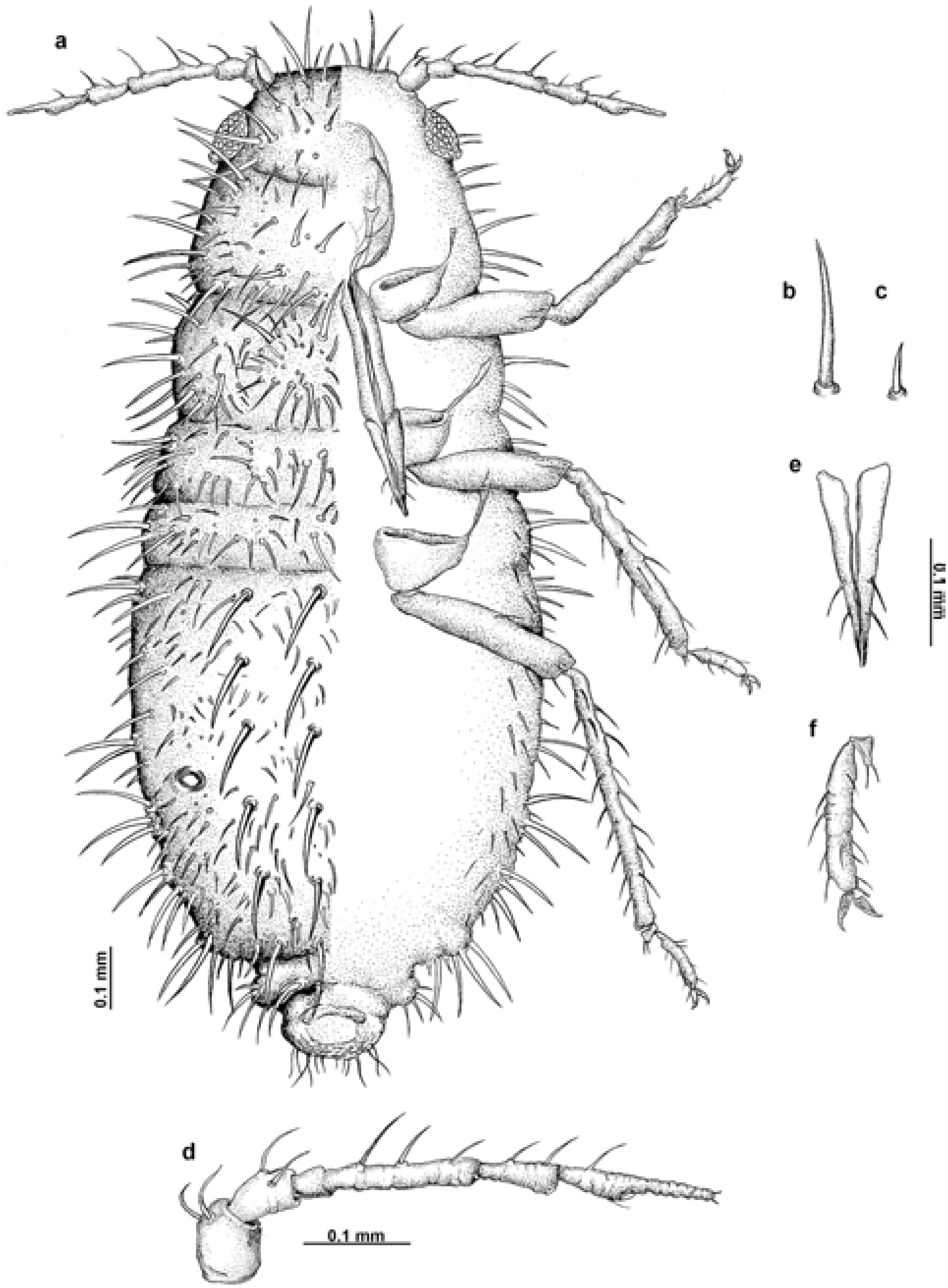


Fig. 54. *Ch. massagetica* — apterous viviparous female:
a — general feature, **b**, **c** — dorsal hairs, **d** — antenna, **e** — apical segment of rostrum, **f** — hind tarsus

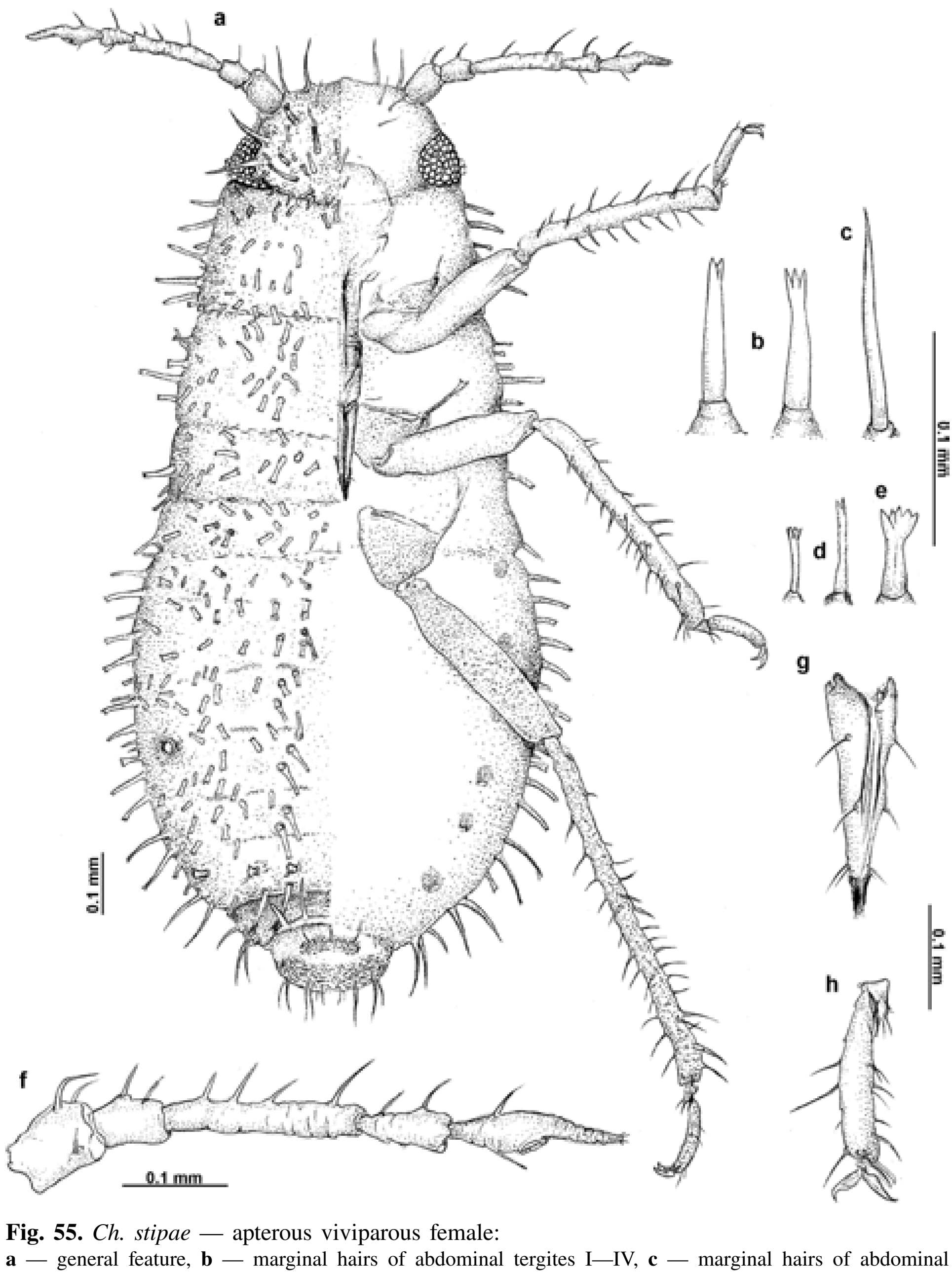


Fig. 55. *Ch. stipae* — apterous viviparous female:
a — general feature, **b** — marginal hairs of abdominal tergites I—IV, **c** — marginal hairs of abdominal tergites VII—VII, **d**, **e** — pleural and spinal hairs of abdominal tergites, **f** — antenna, **g** — apical segment of rostrum, **h** — hind tarsus

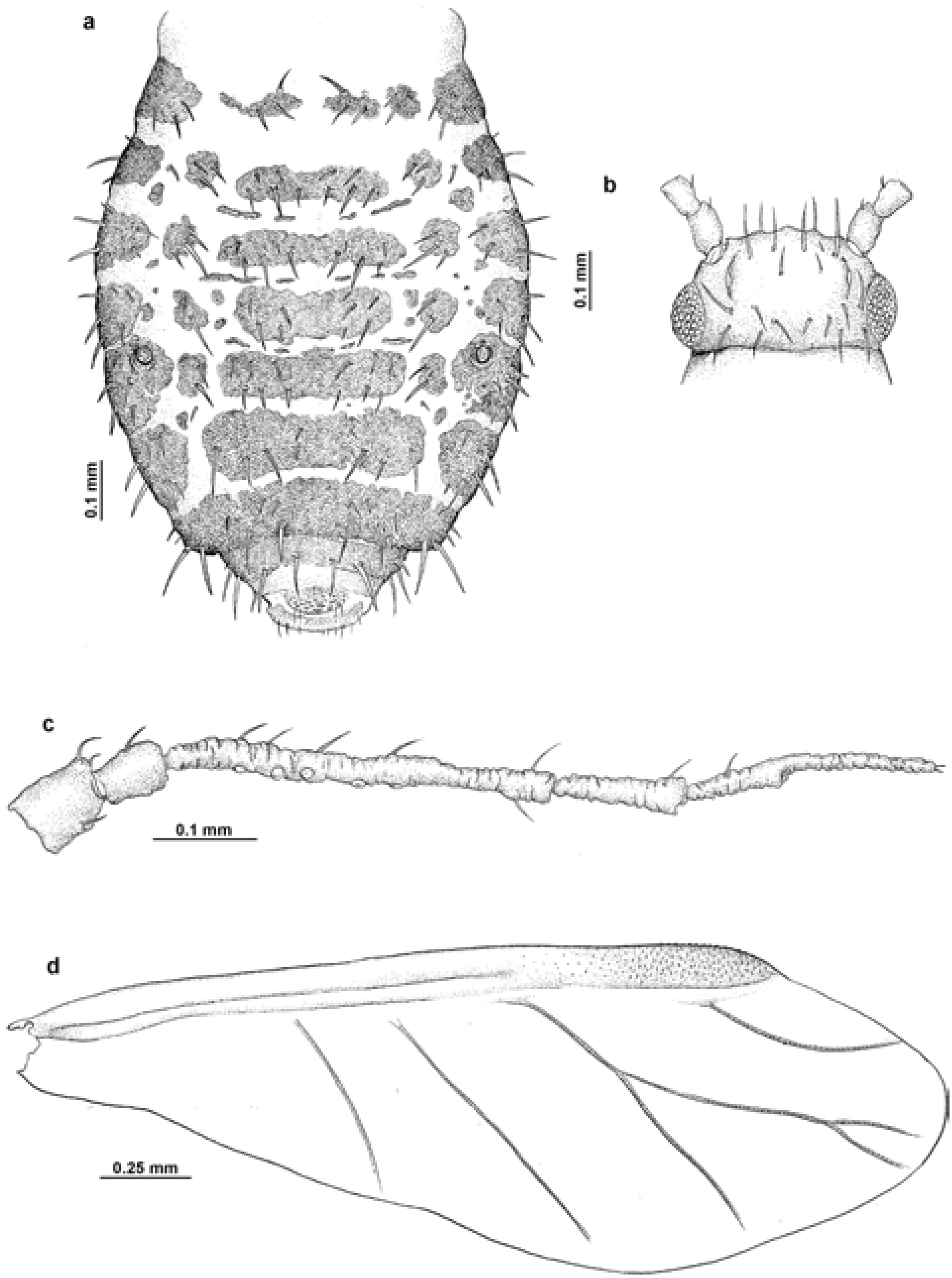


Fig. 56. *Ch. stipae* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

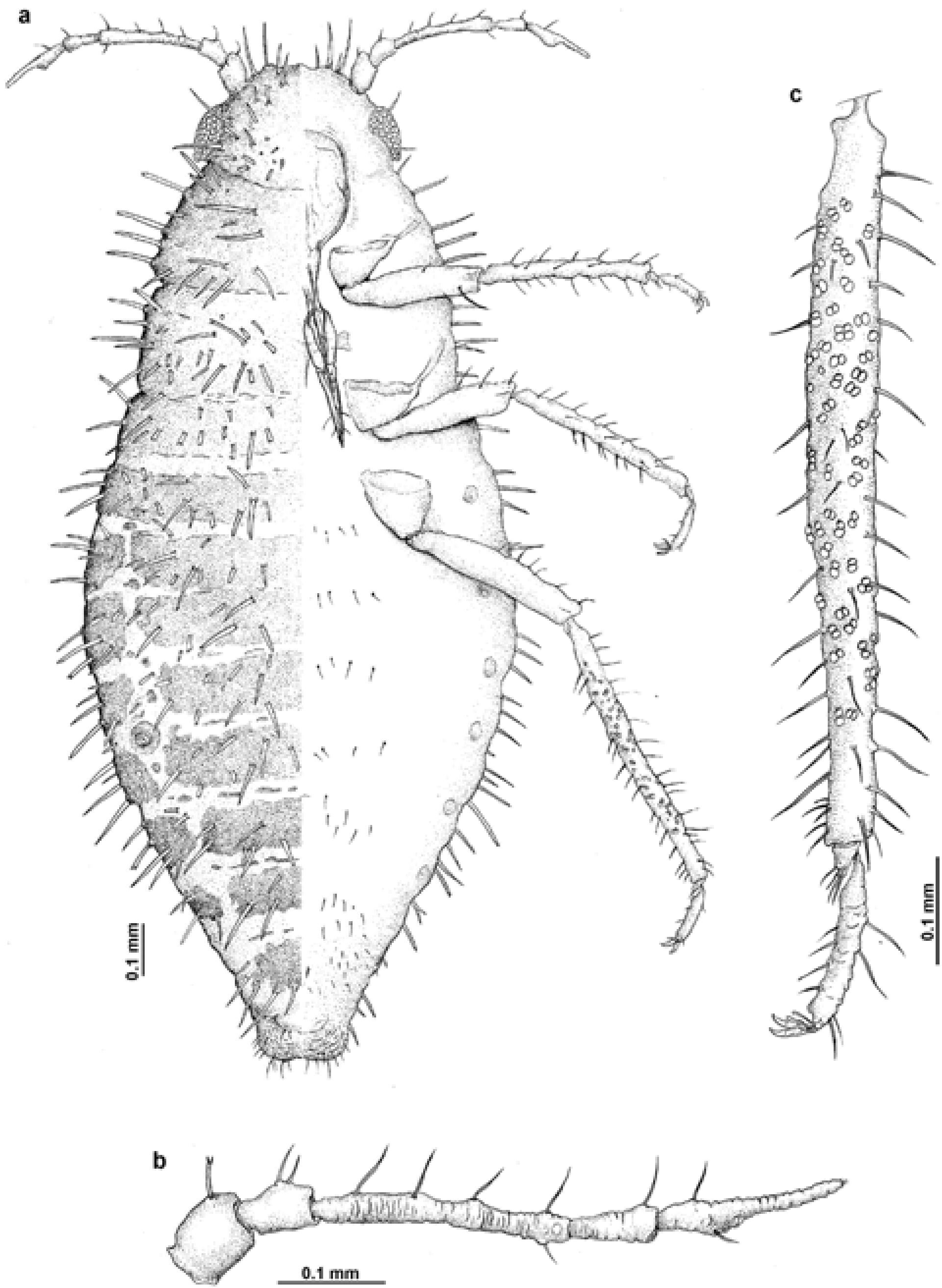


Fig. 57. *Ch. stipae* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

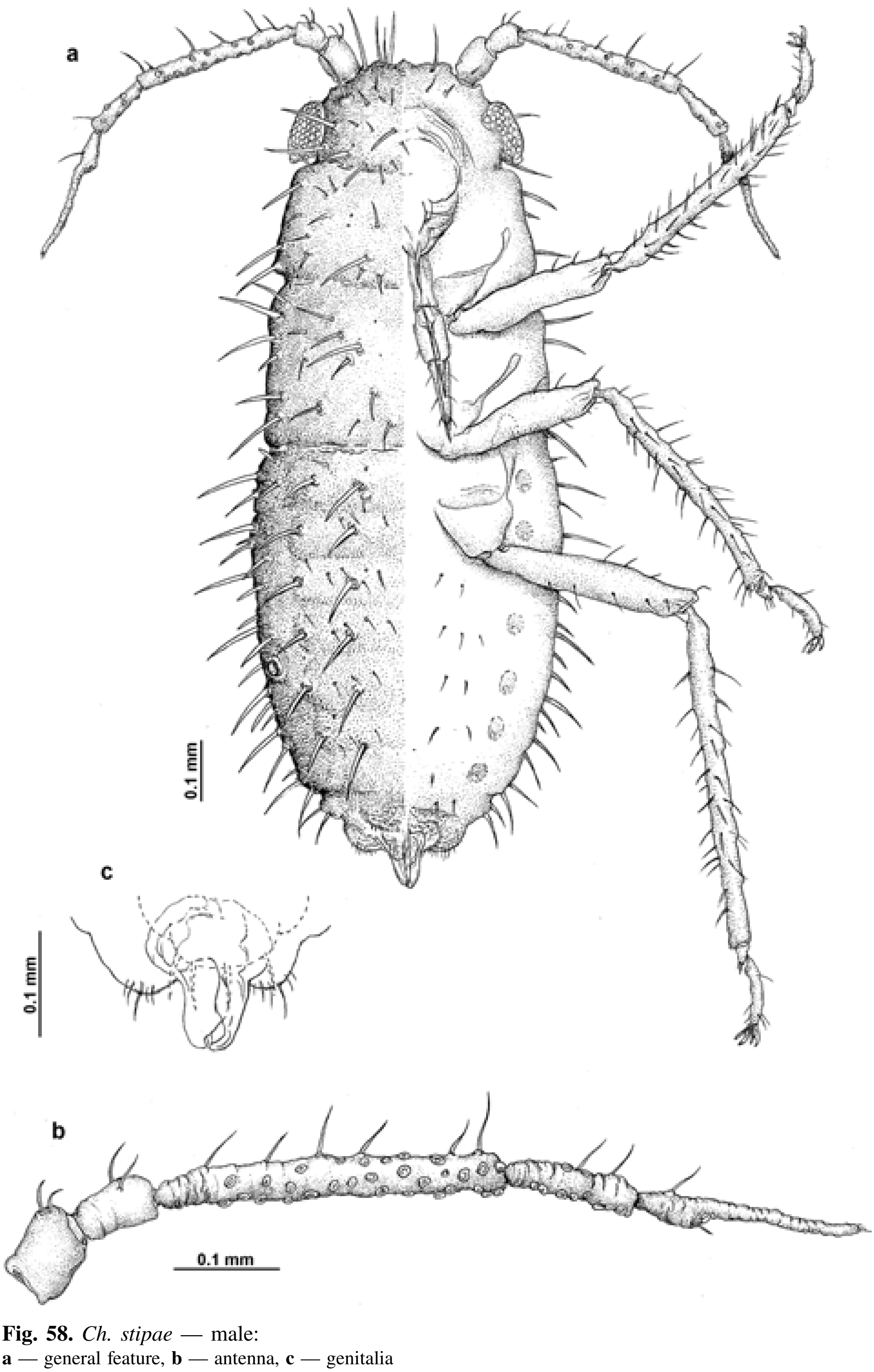


Fig. 58. *Ch. stipae* — male:
a — general feature, **b** — antenna, **c** — genitalia

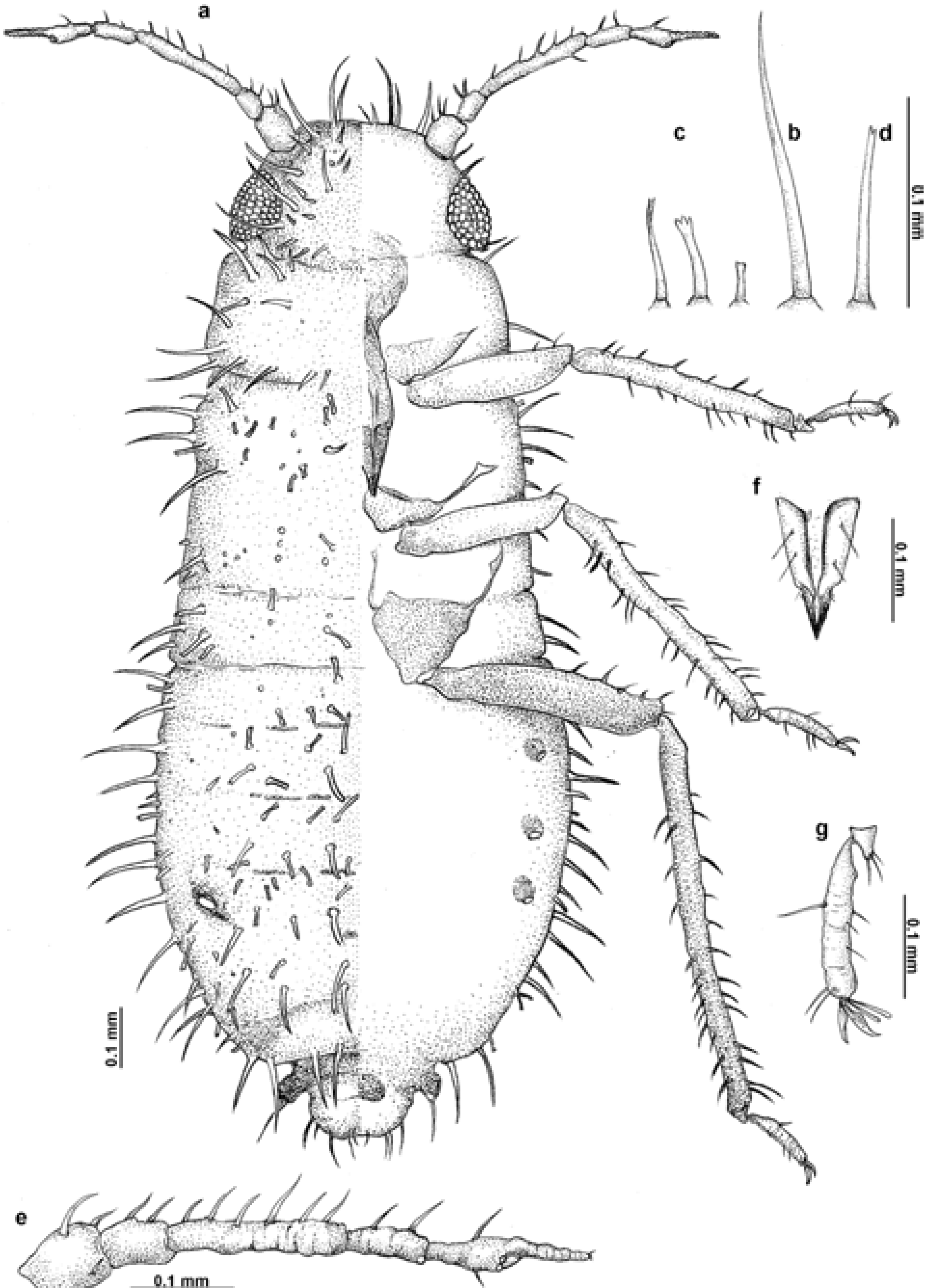


Fig. 59. *Ch. stipae* subsp. *setosa* — apterous viviparous female:
a — general feature, **b** — marginal hairs of abdominal terites, **c** — hairs across abdominal tergites I—V, **d** — hairs of abdominal tergite VI, **e** — antenna, **f** — apical segment of rostrum, **g** — hind tarsus

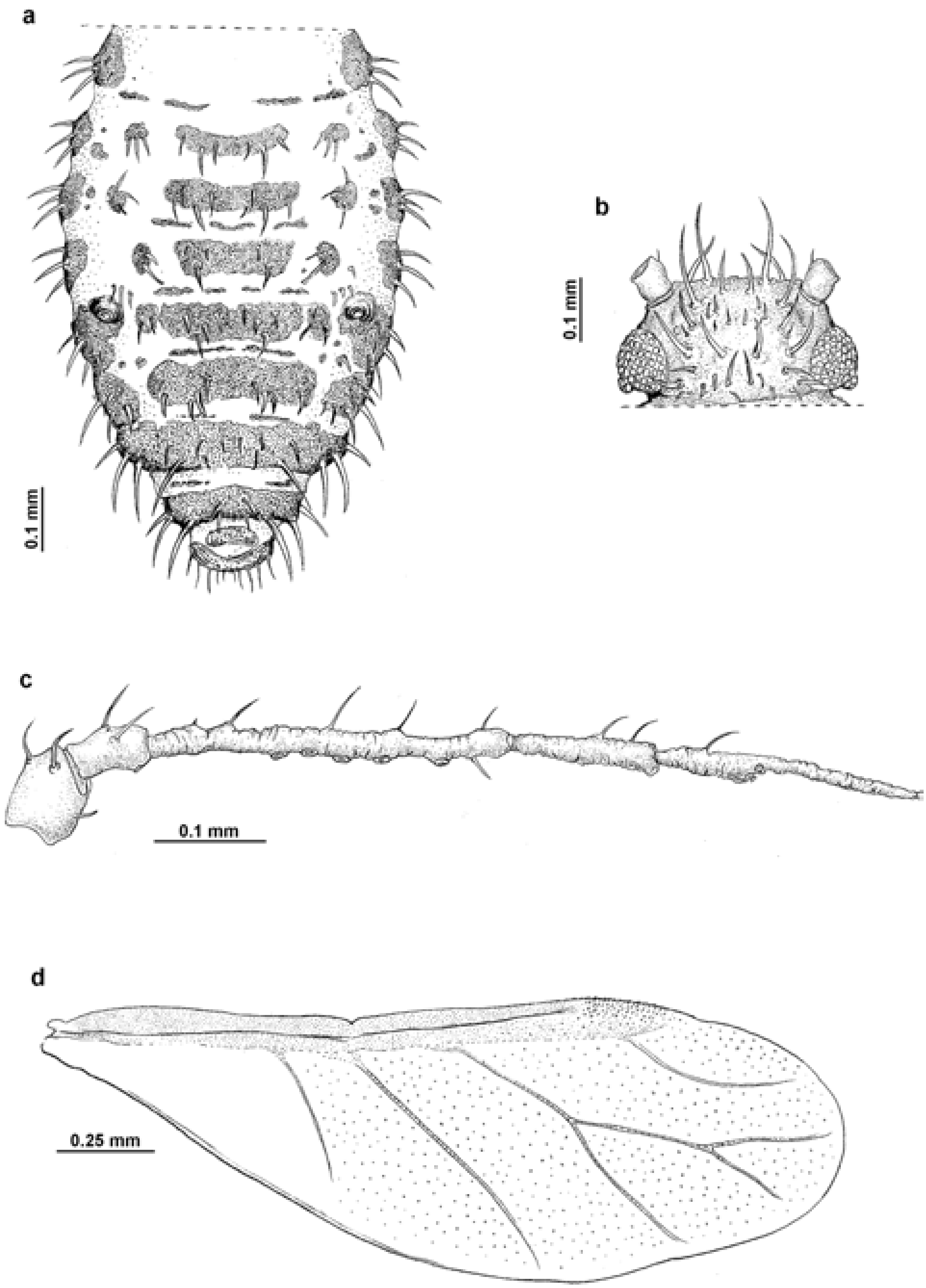


Fig. 60. *Ch. stipae* subsp. *setosa* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

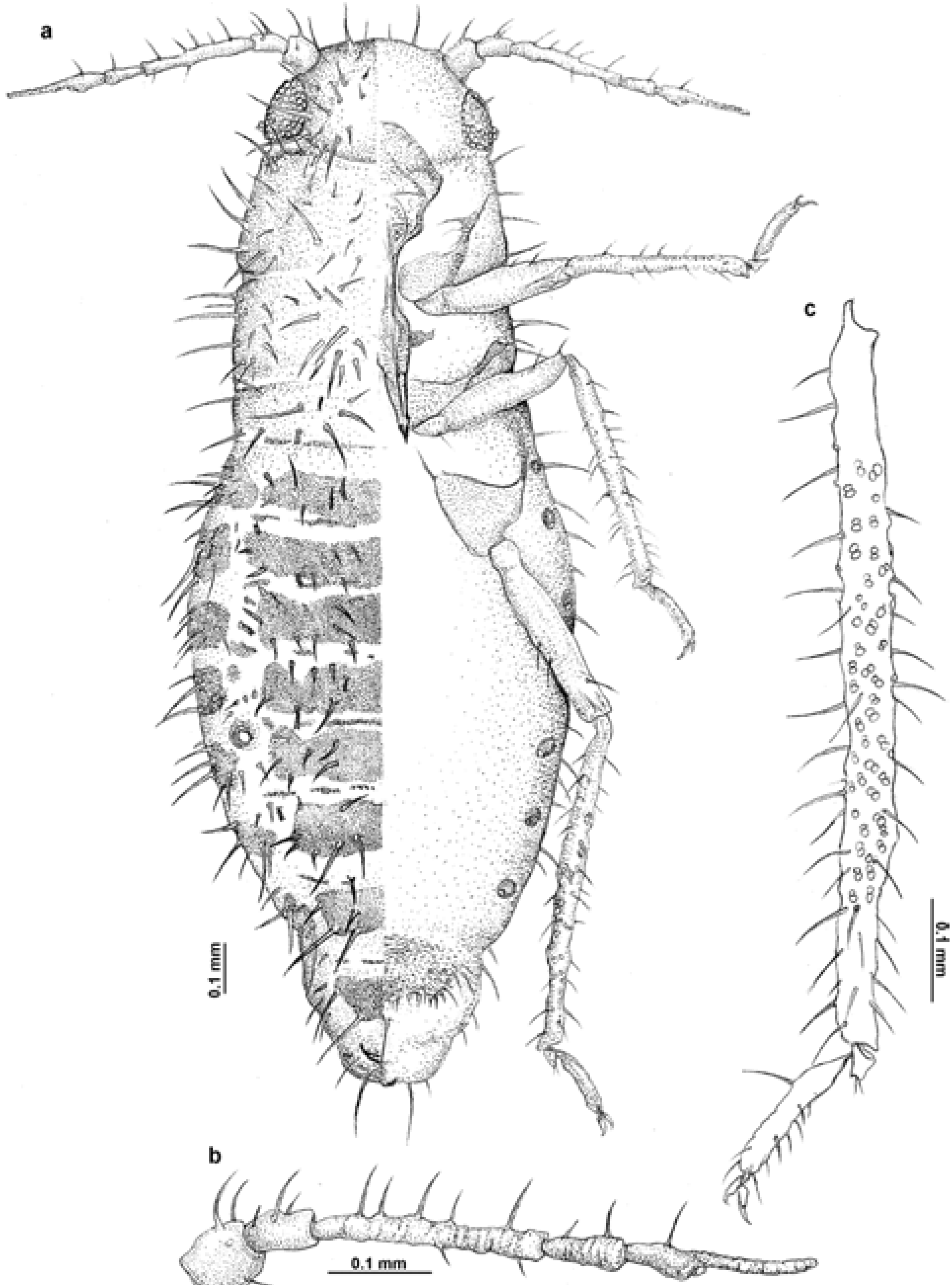


Fig. 61. *Ch. stipae* subsp. *setosa* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

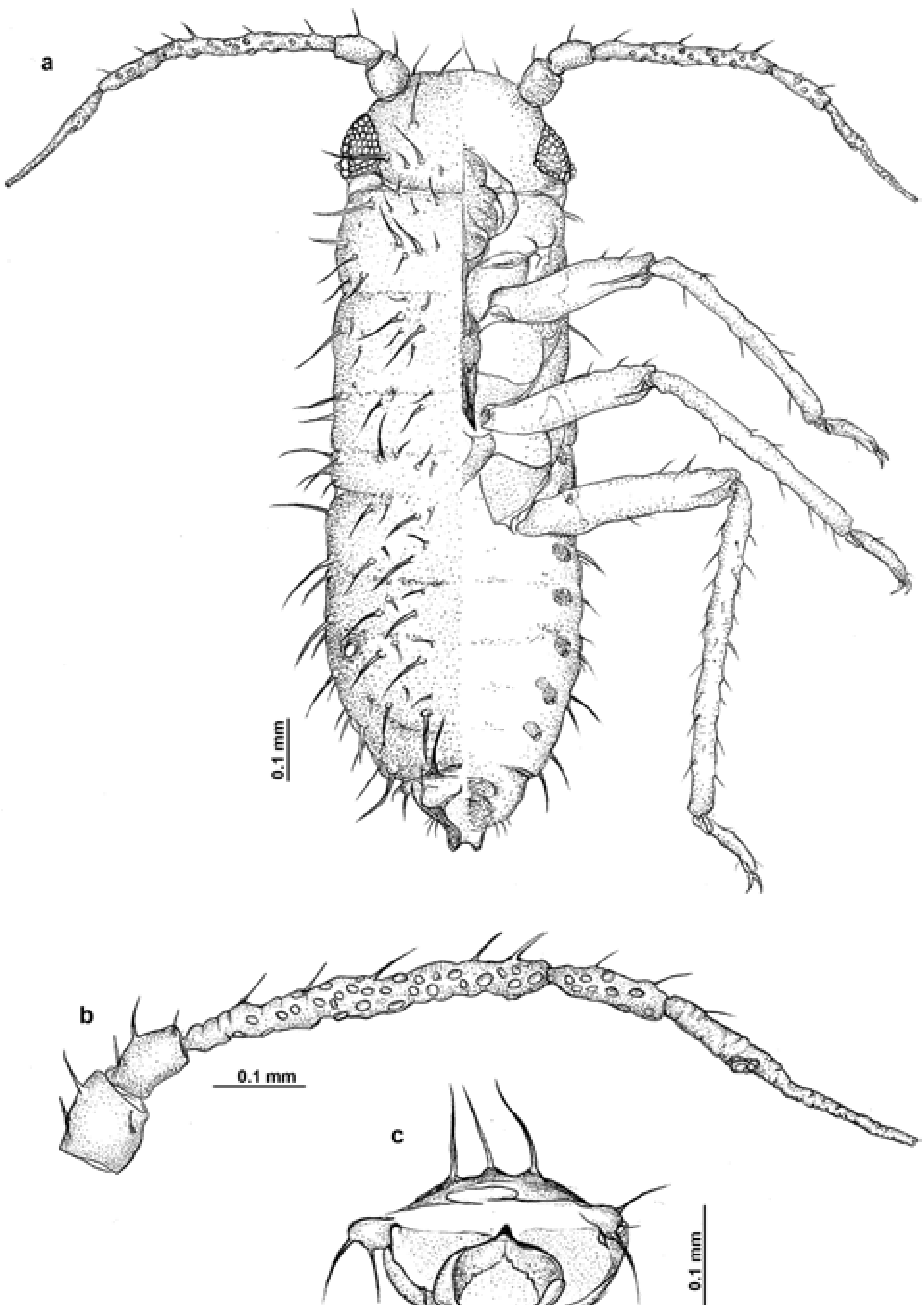


Fig. 62. *Ch. stipae* subsp. *setosa* — male:
a — general feature, **b** — antenna, **c** — genitalia

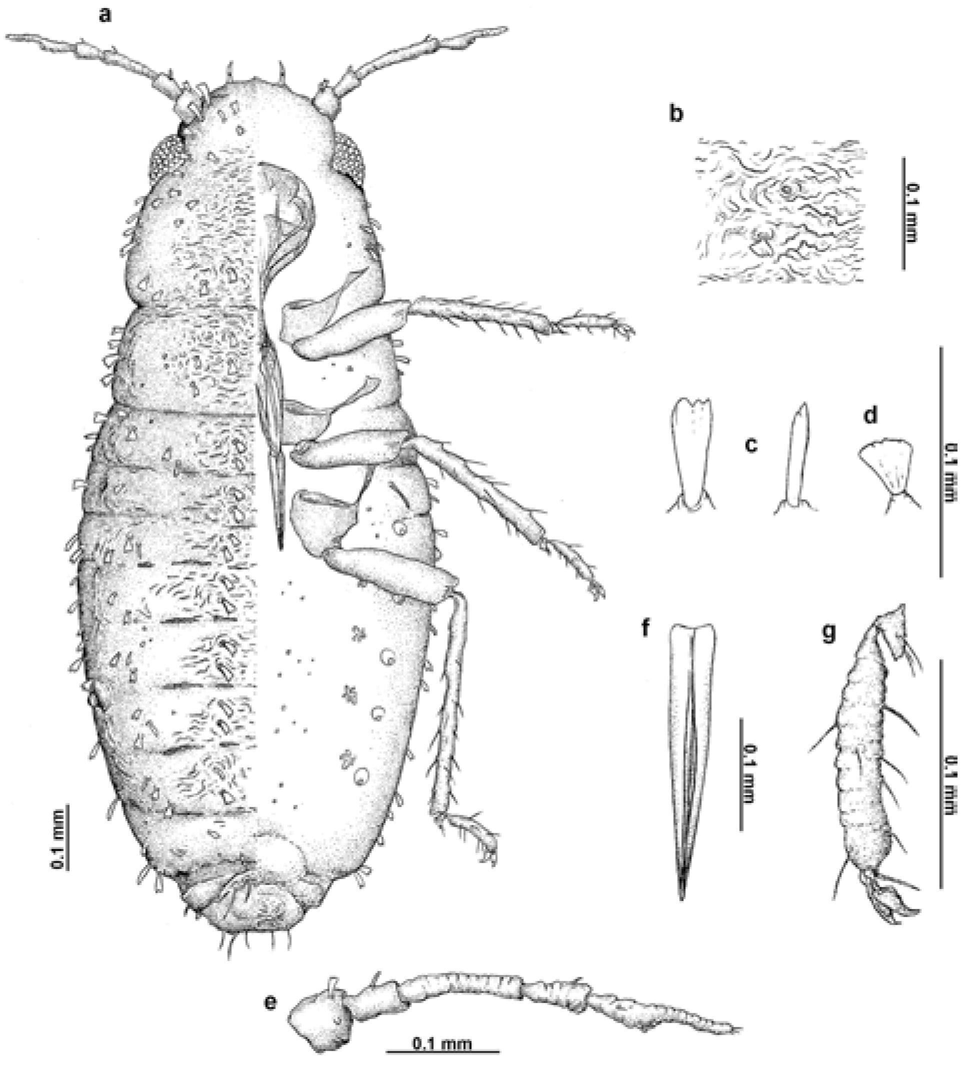


Fig. 63. *Ch. tshernavini* — apterous viviparous female:
a — general feature, **b** — sculpture, **c** — marginal hairs, **d** — pleural and spinal hairs, **e** — antenna, **f** — apical segment of rostrum, **g** — hind tarsus

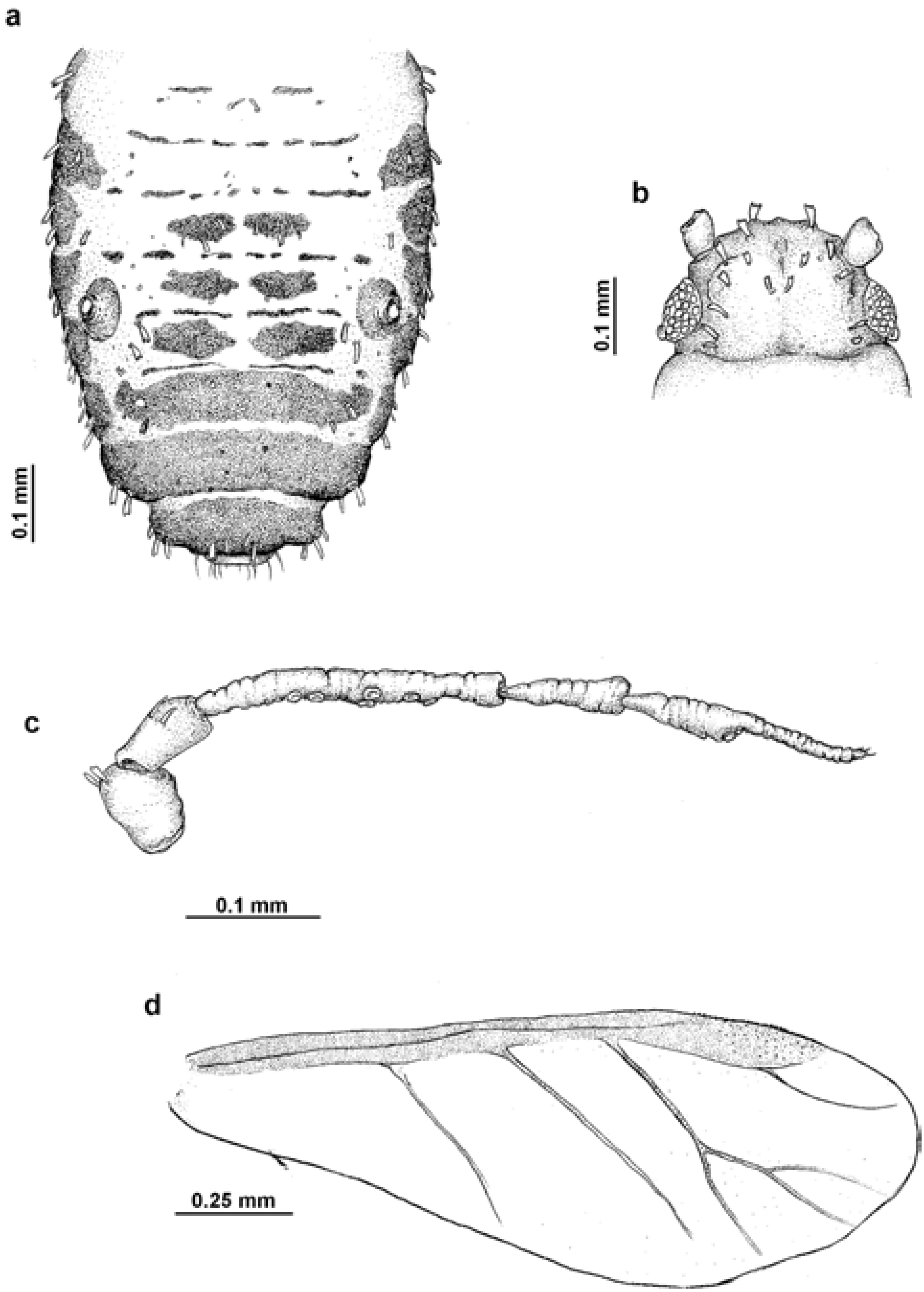


Fig. 64. *Ch. tshernavini* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

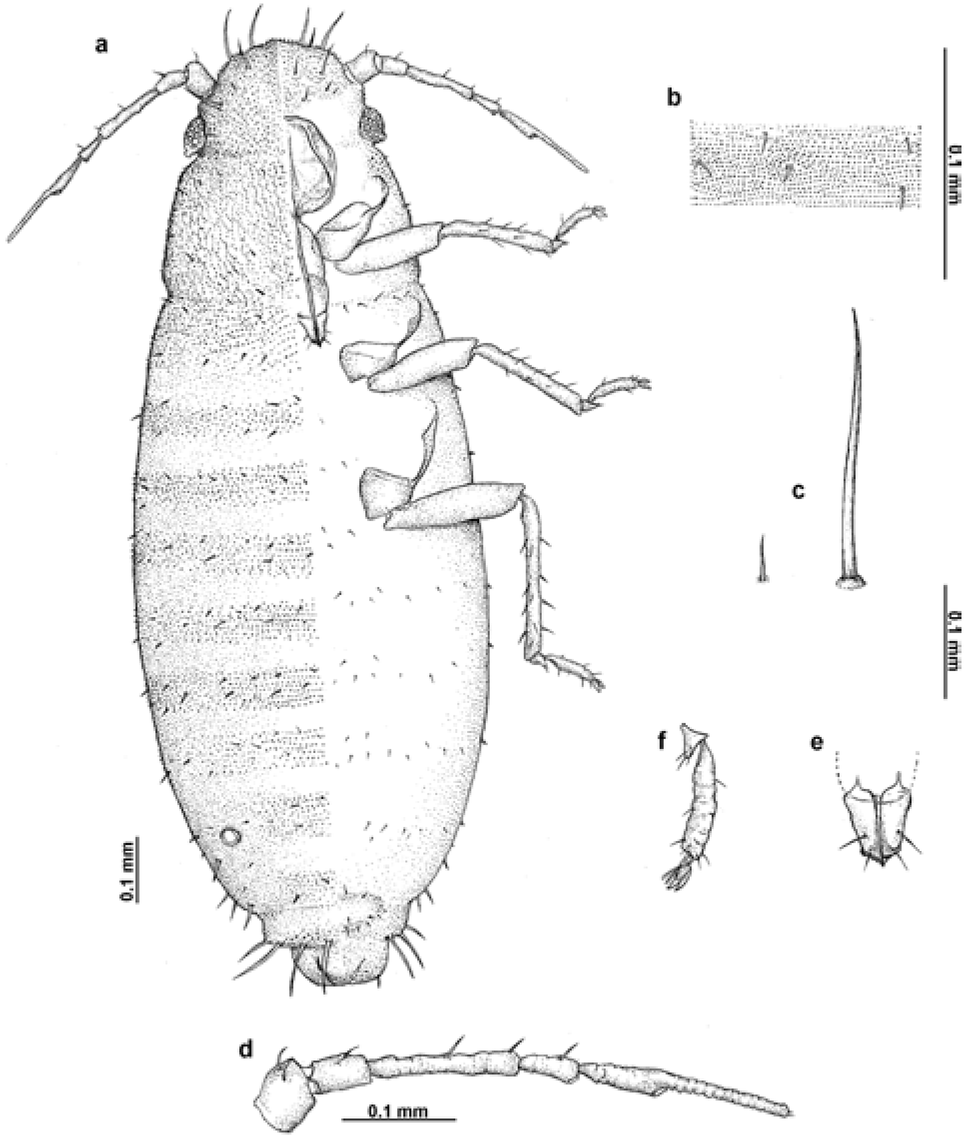


Fig. 65. *L. psammae* — apterous viviparous female:
a — general feature, **b** — sculpture, **c** — marginal hairs, **d** — antenna, **e** — apical segment of rostrum, **f** — hind tarsus

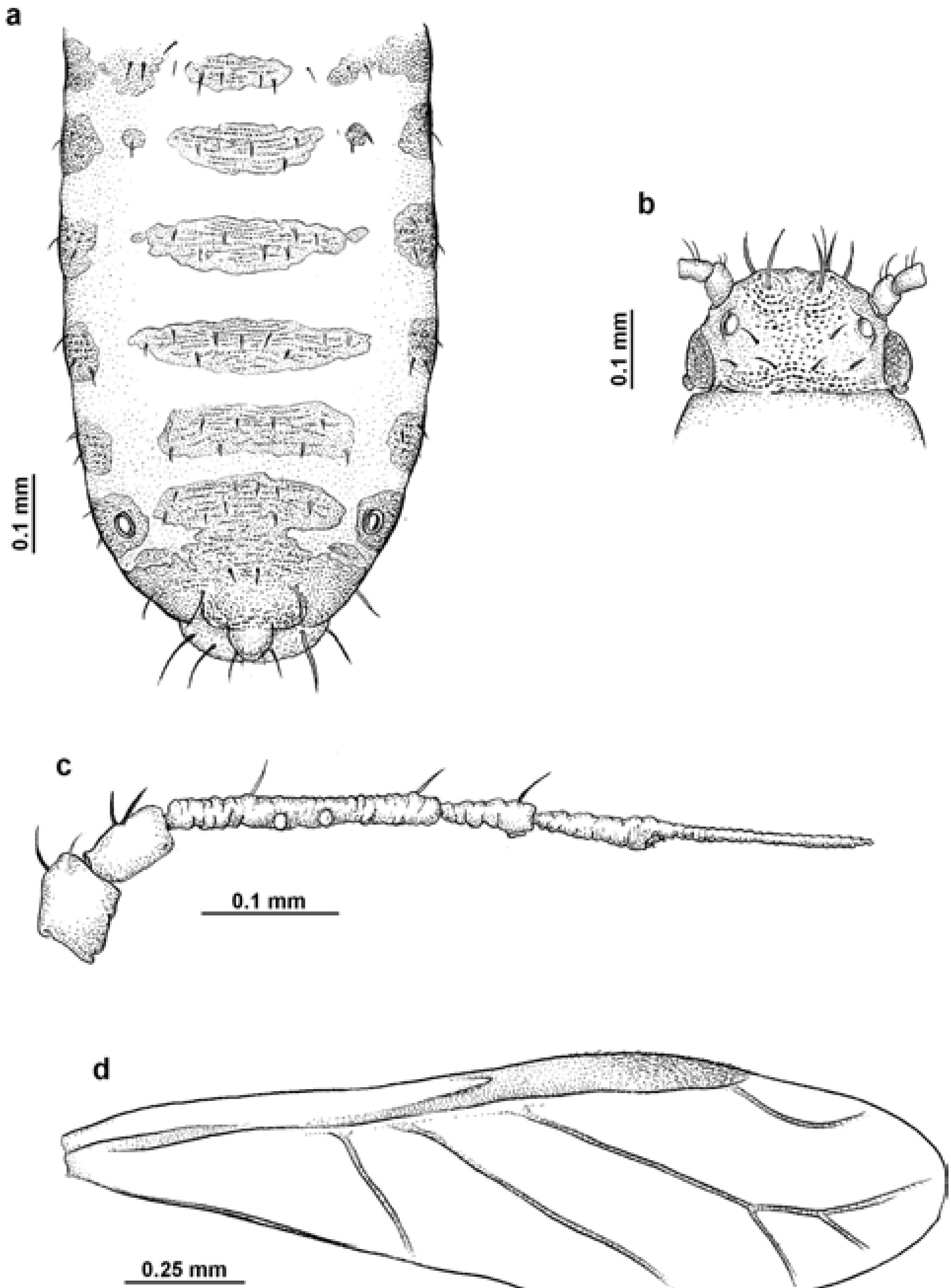


Fig. 66. *L. psammae* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

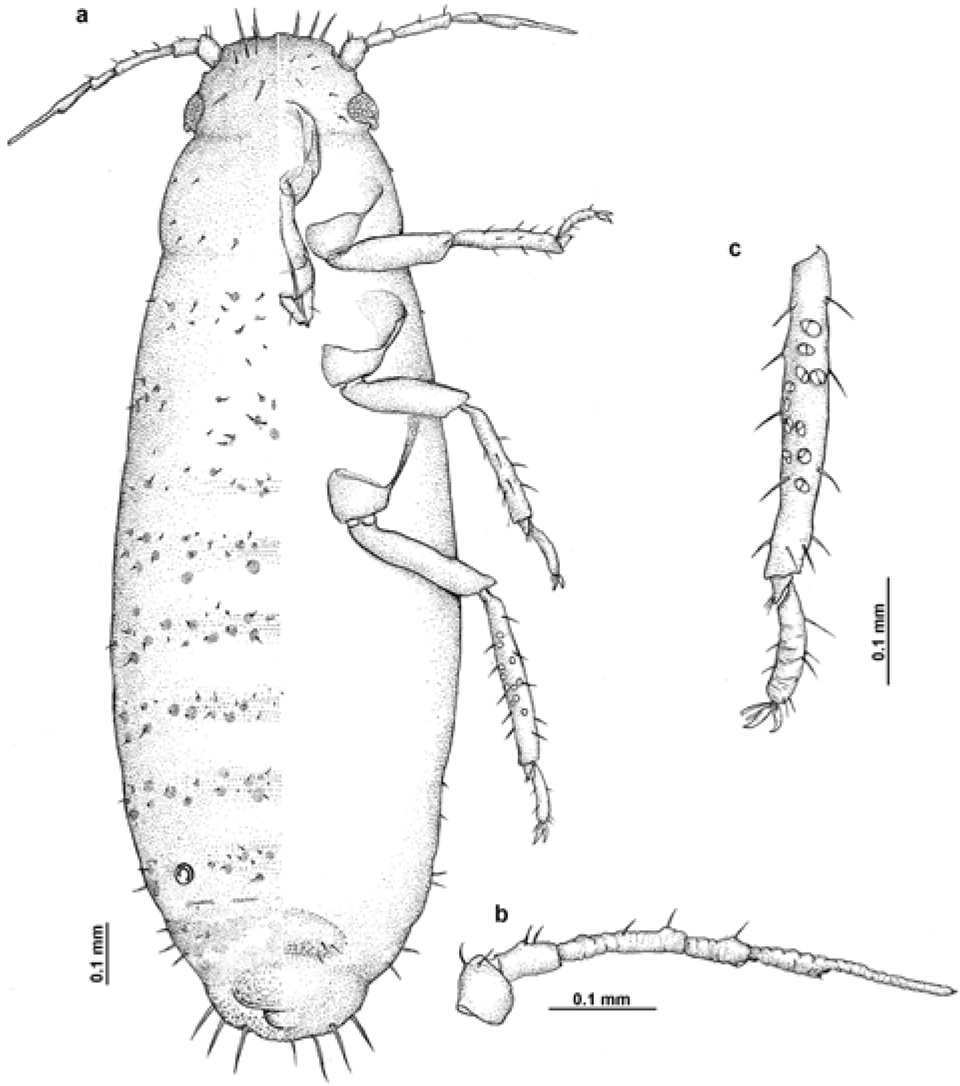


Fig. 67. *L. psammae* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

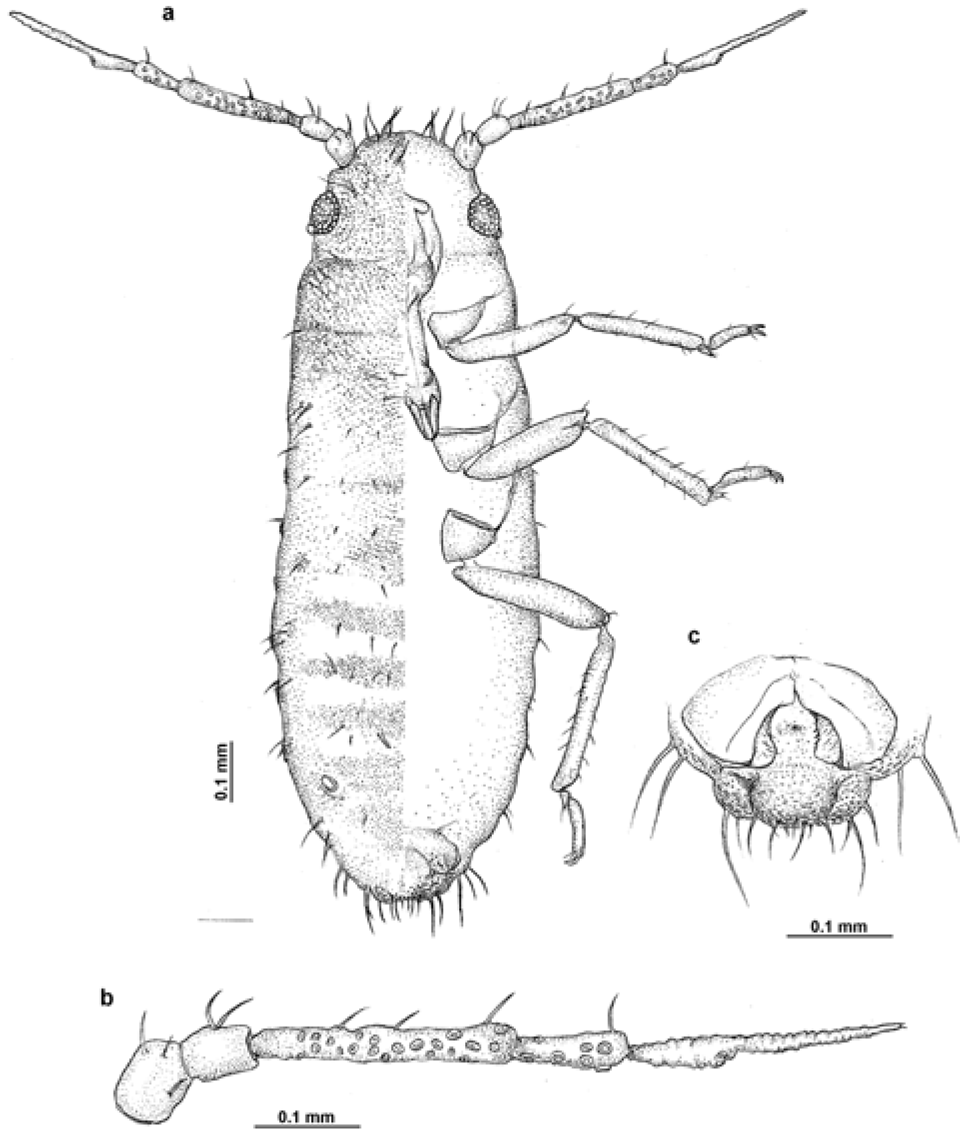


Fig. 68. *L. psammae* — male:
a — general feature, **b** — antenna, **c** — genitalia

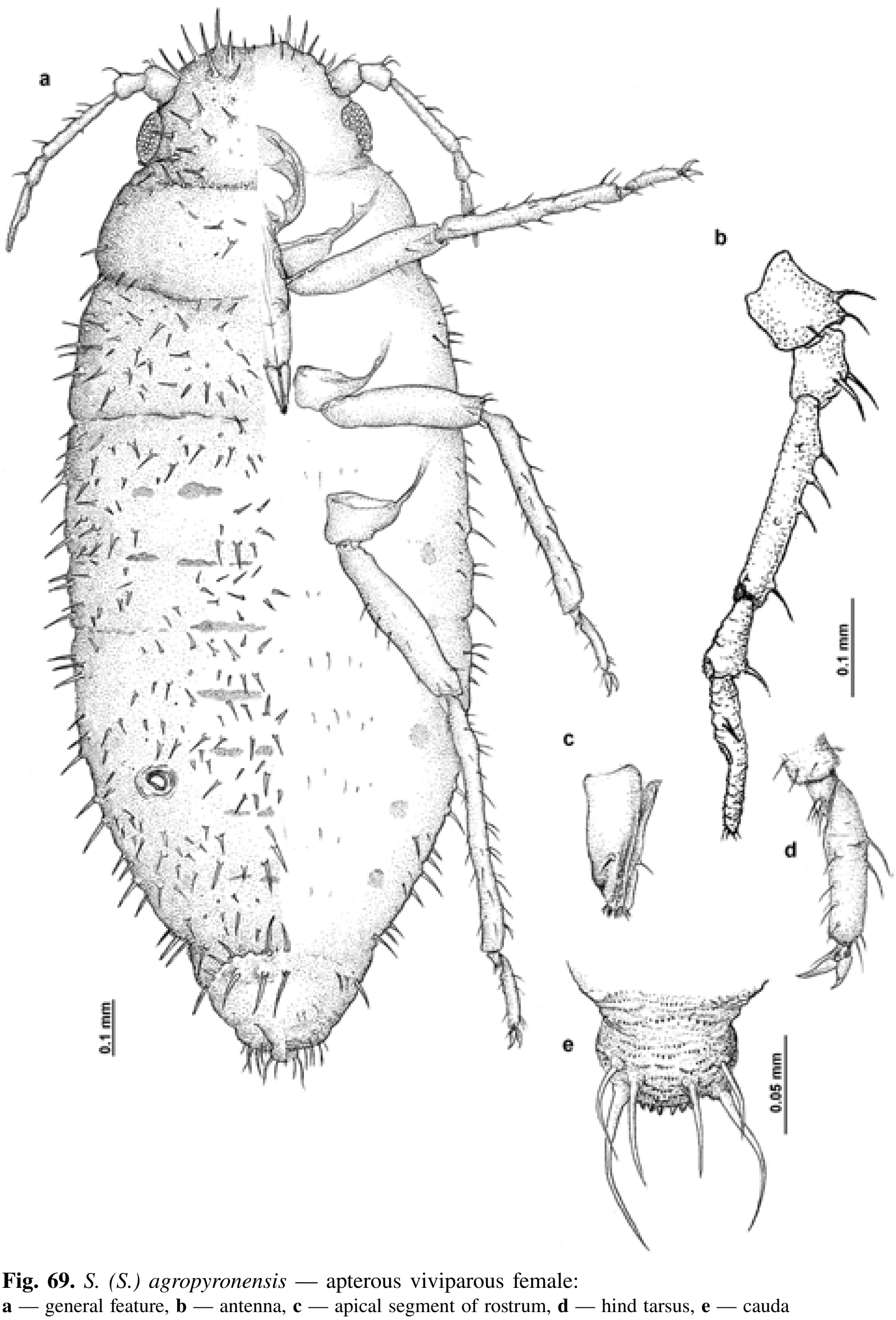


Fig. 69. *S. (S.) agropyronensis* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — cauda

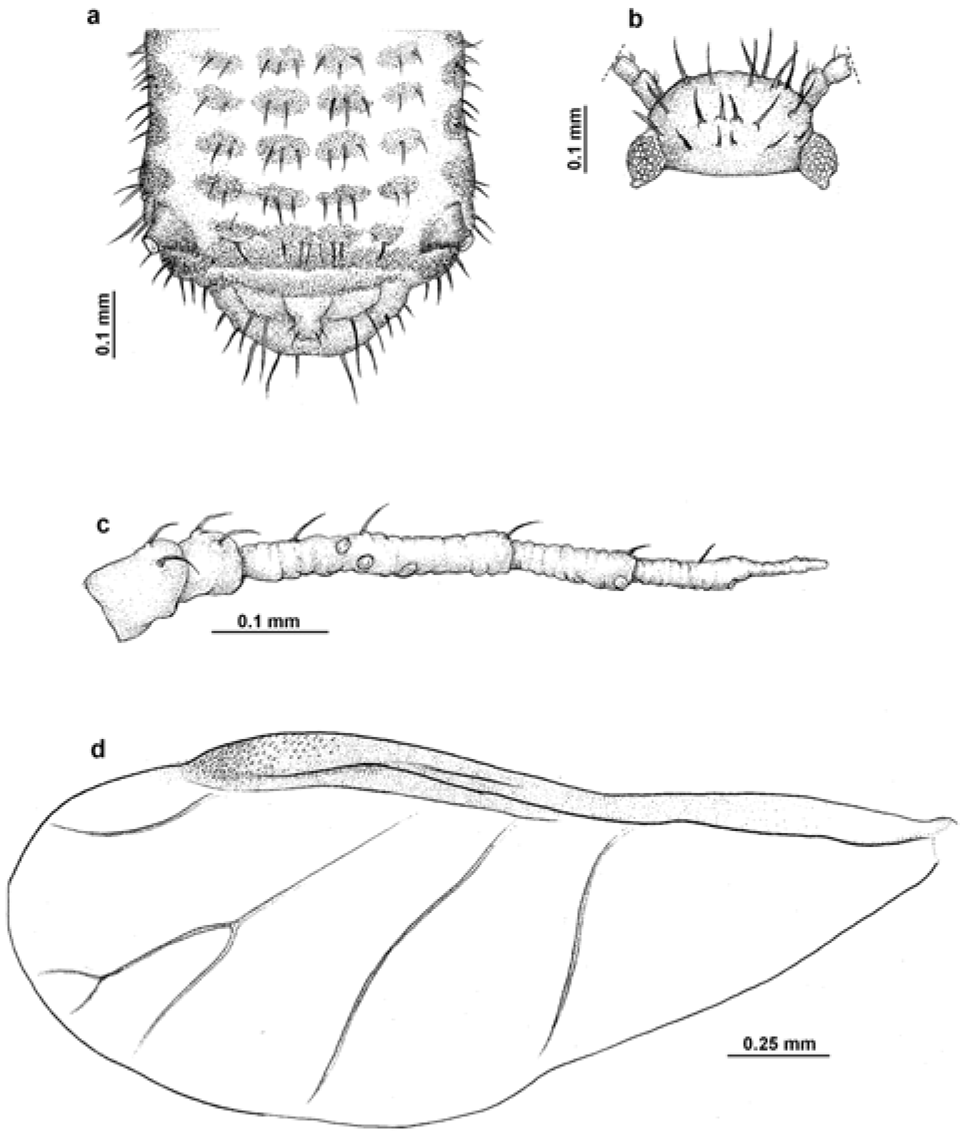


Fig. 70. *S. (S.) agropyronensis* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

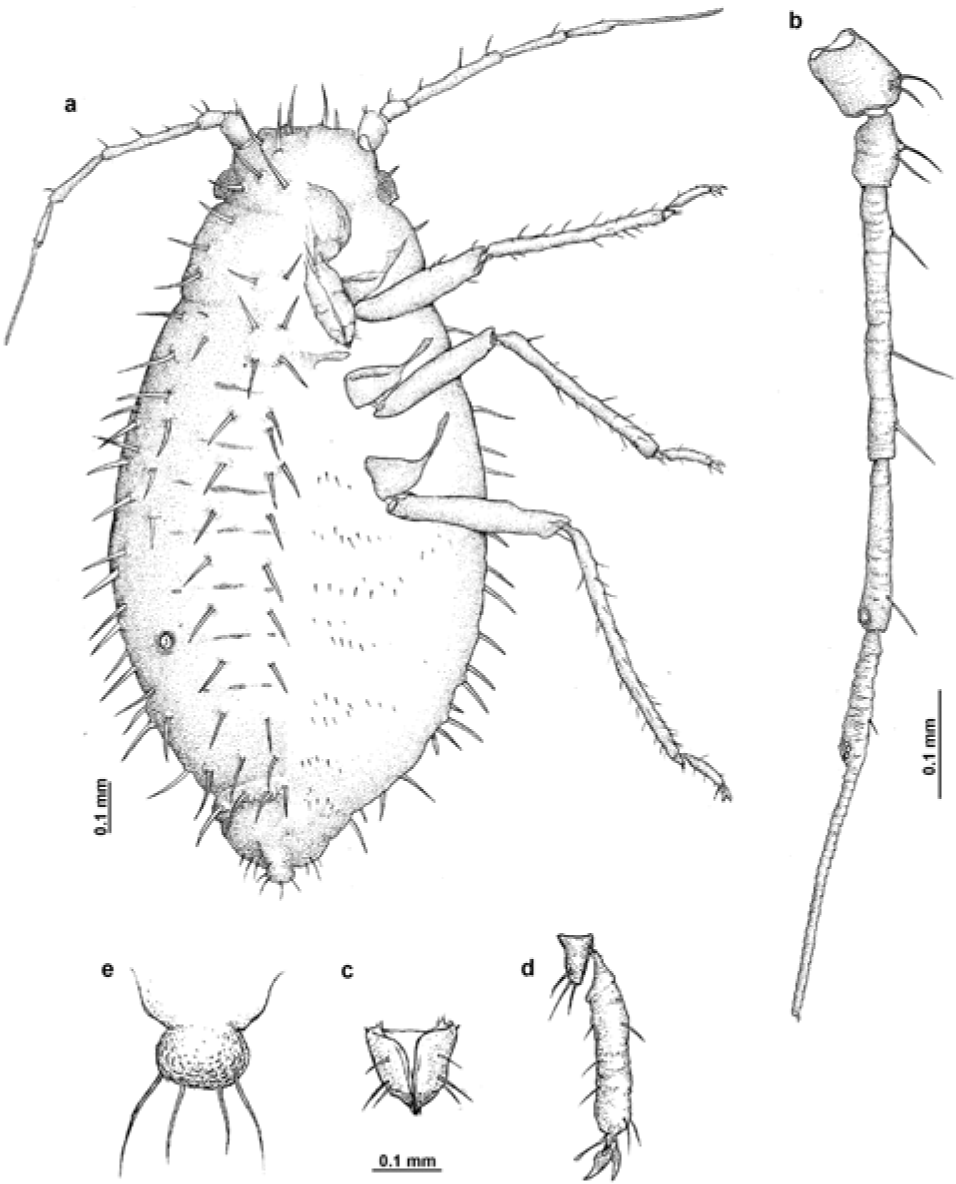


Fig. 71. *S. (S.) flava* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — cauda

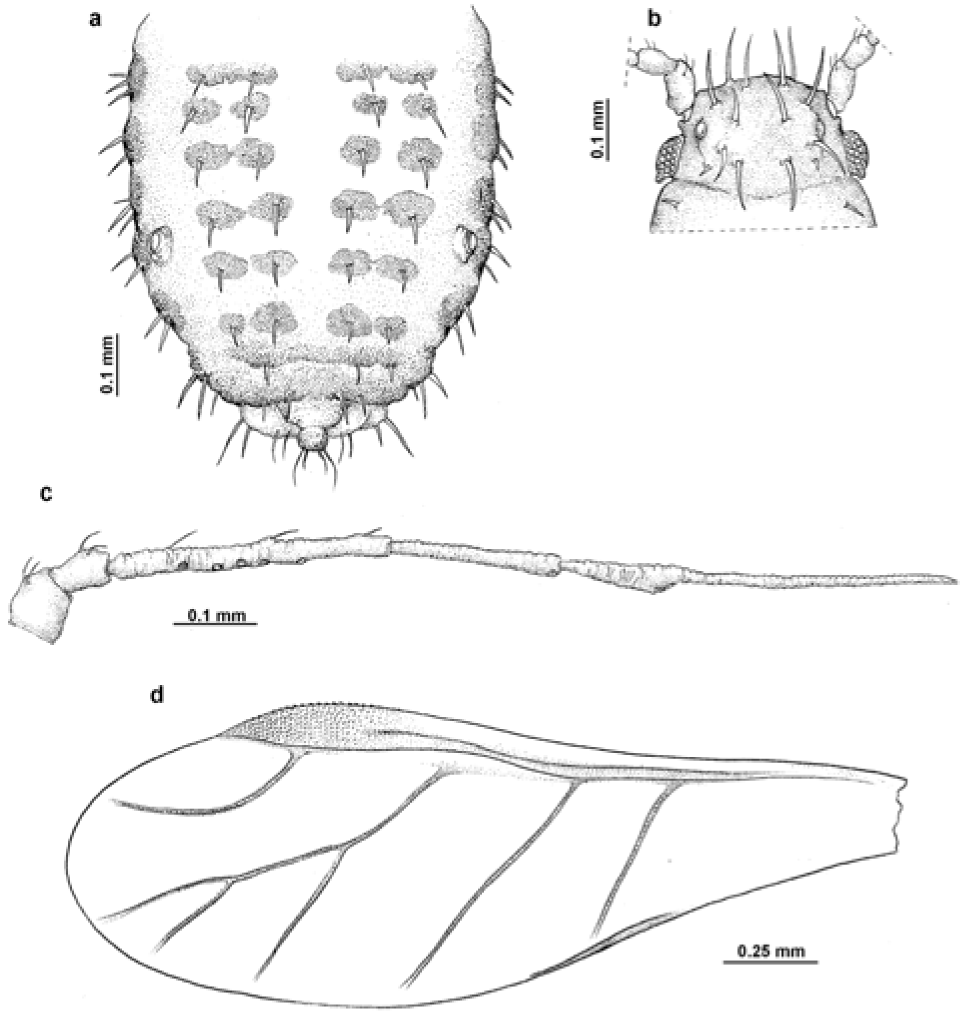


Fig. 72. *S. (S.) flava* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

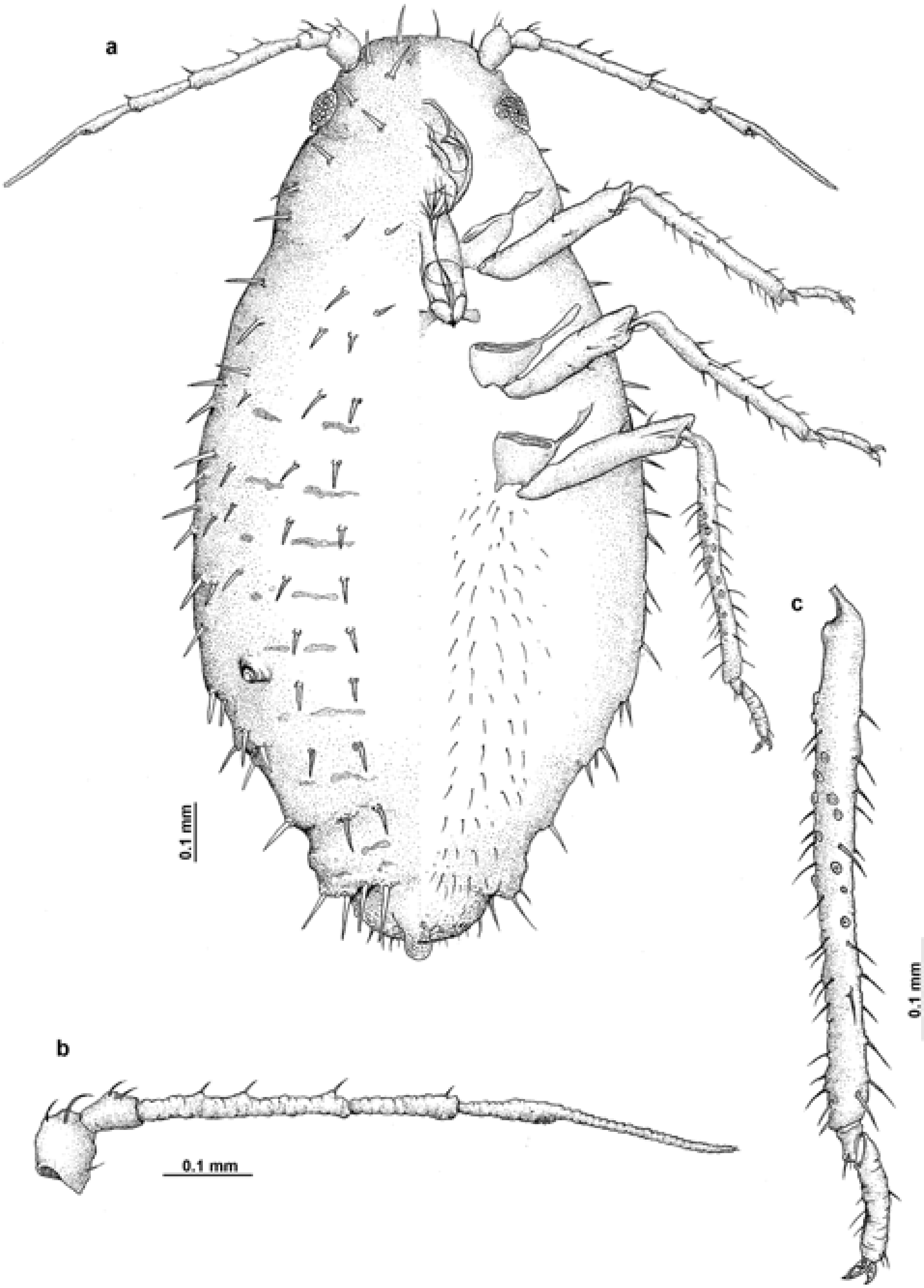


Fig. 73. *S. (S.) flava* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

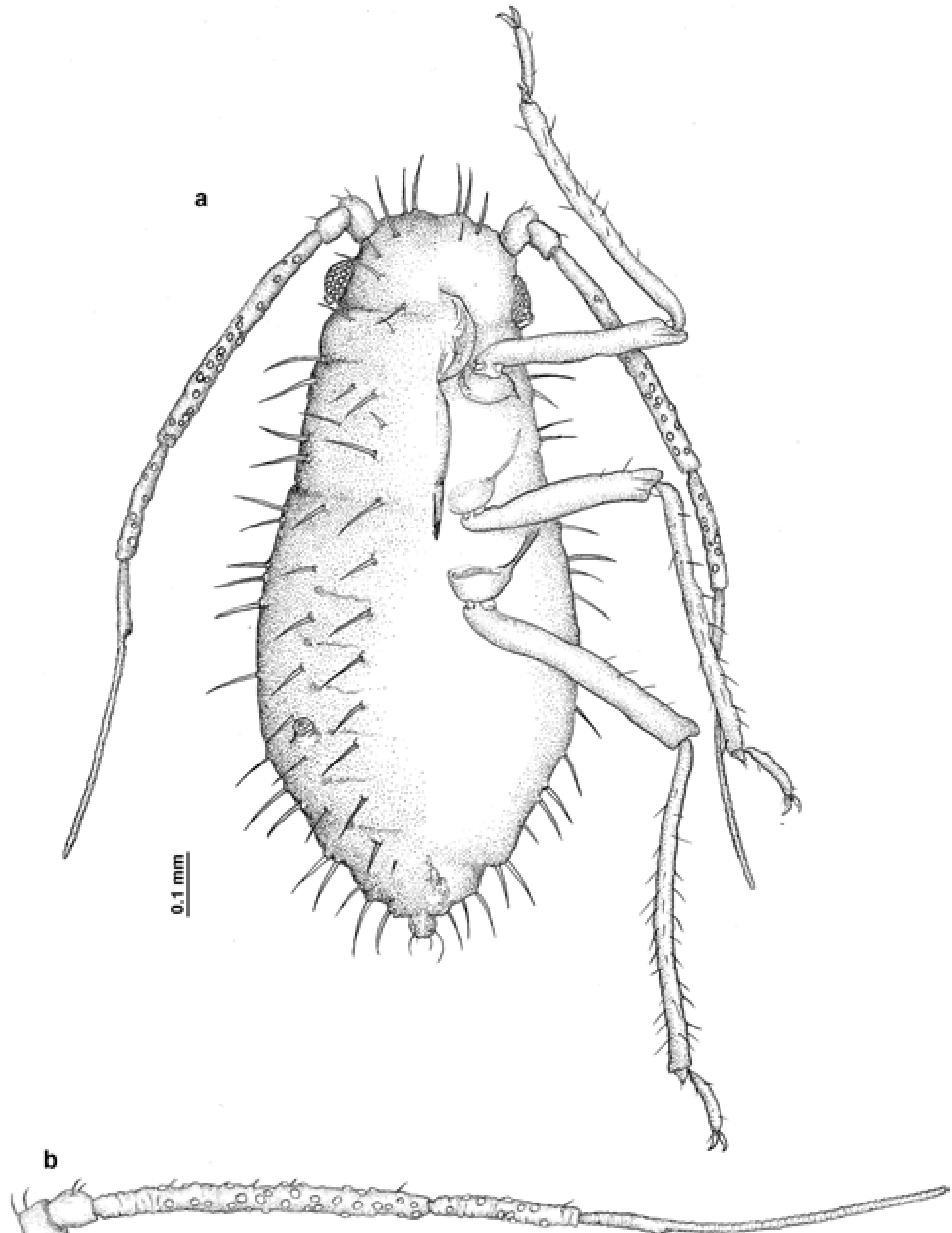


Fig. 74. *S. (S.) flava* — male:
a — general feature, **b** — antenna

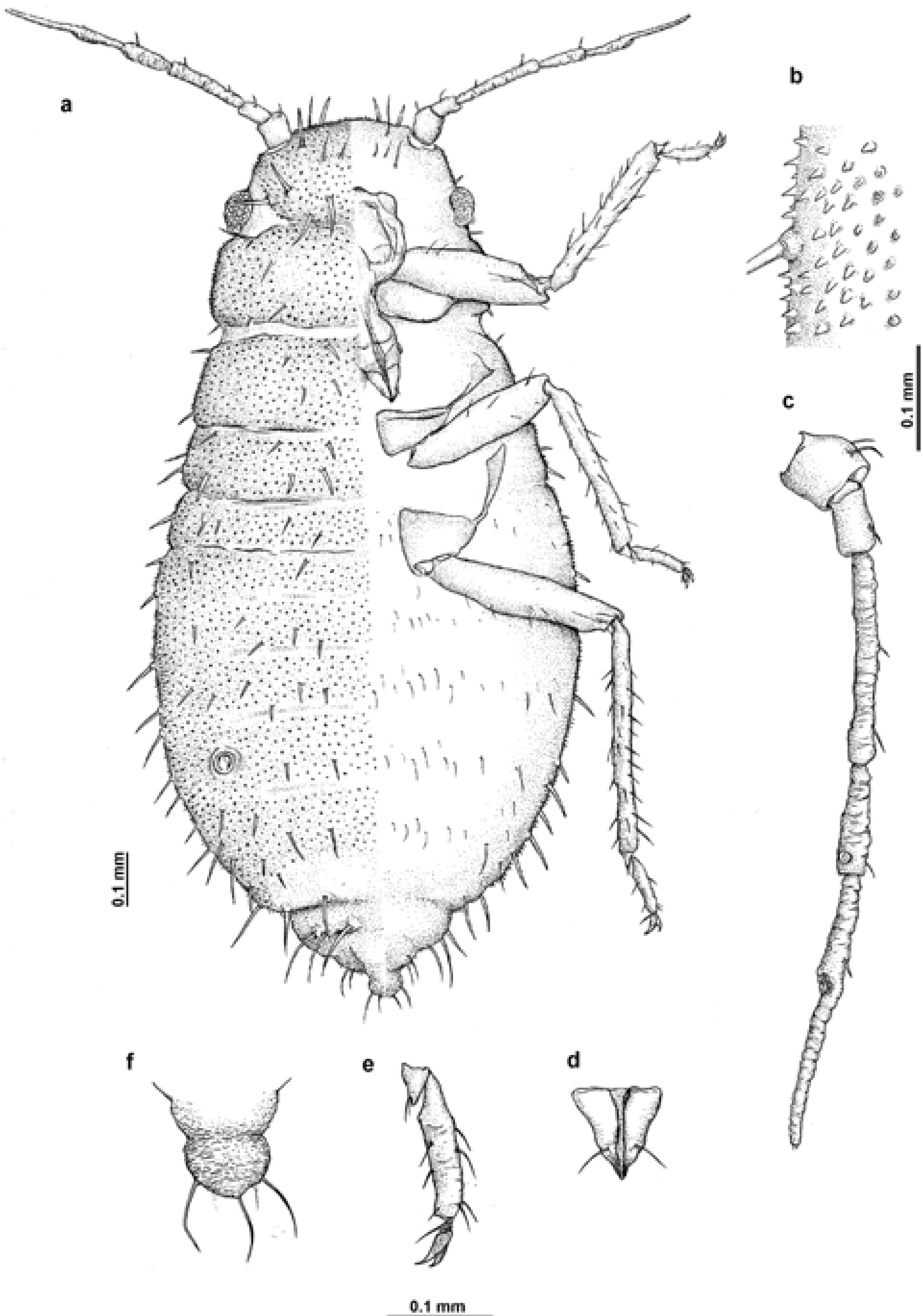


Fig. 75. *S. (S.) glyceriae* — apterous viviparous female:
a — general feature, **b** — sculpture, **c** — antenna, **d** — apical segment of rostrum, **e** — hind tarsus, **f** — cauda

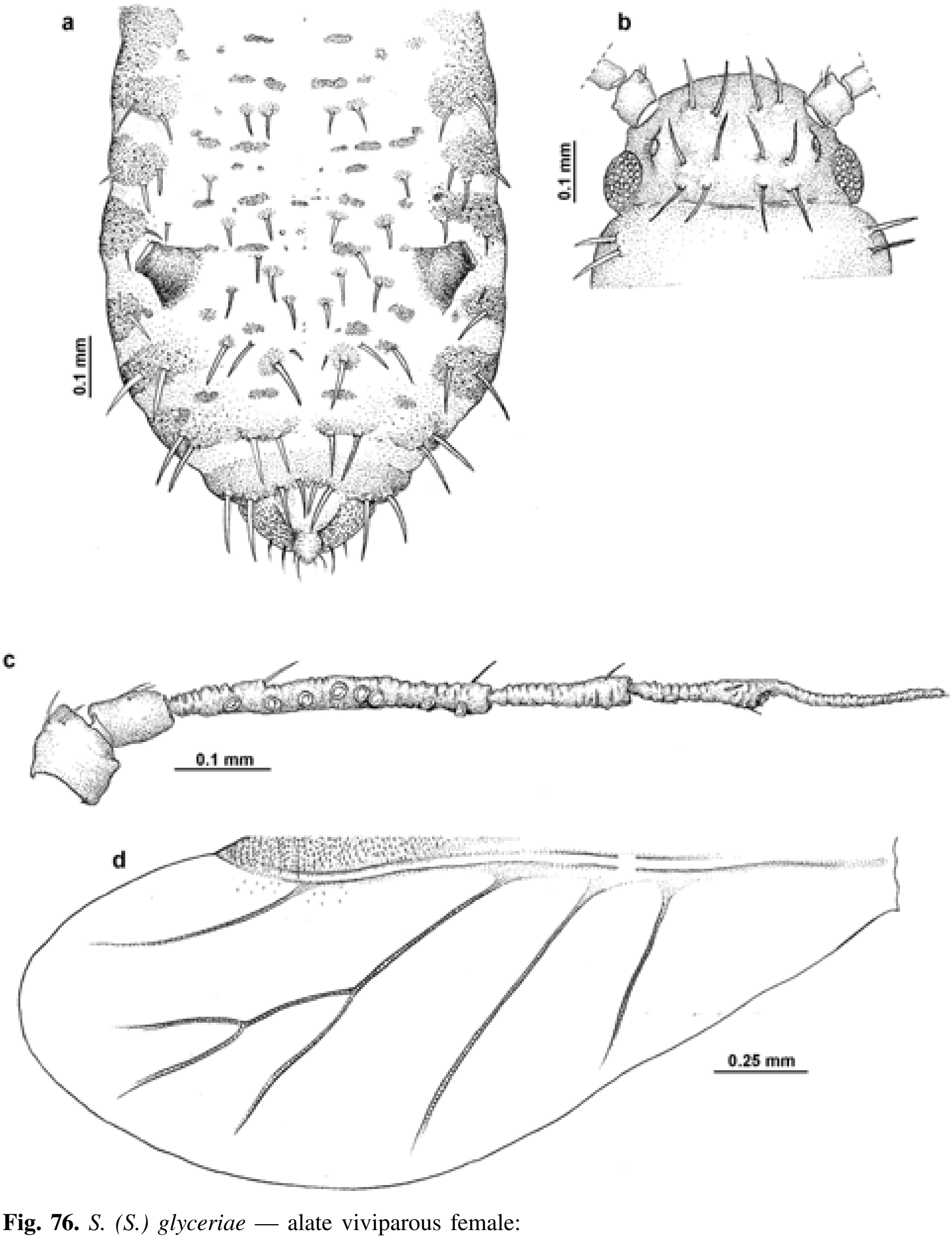


Fig. 76. *S. (S.) glyceriae* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

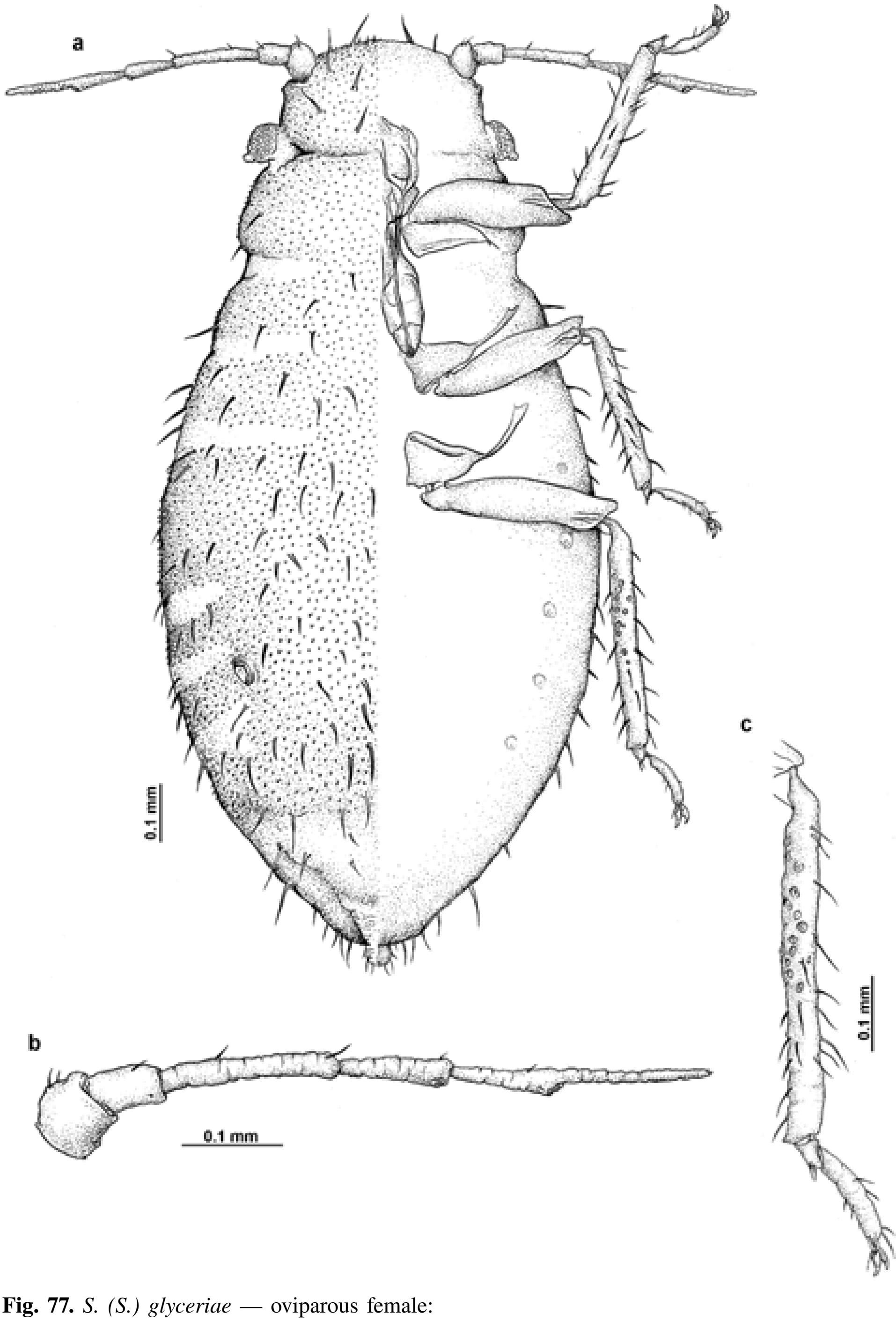


Fig. 77. *S. (S.) glyceriae* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

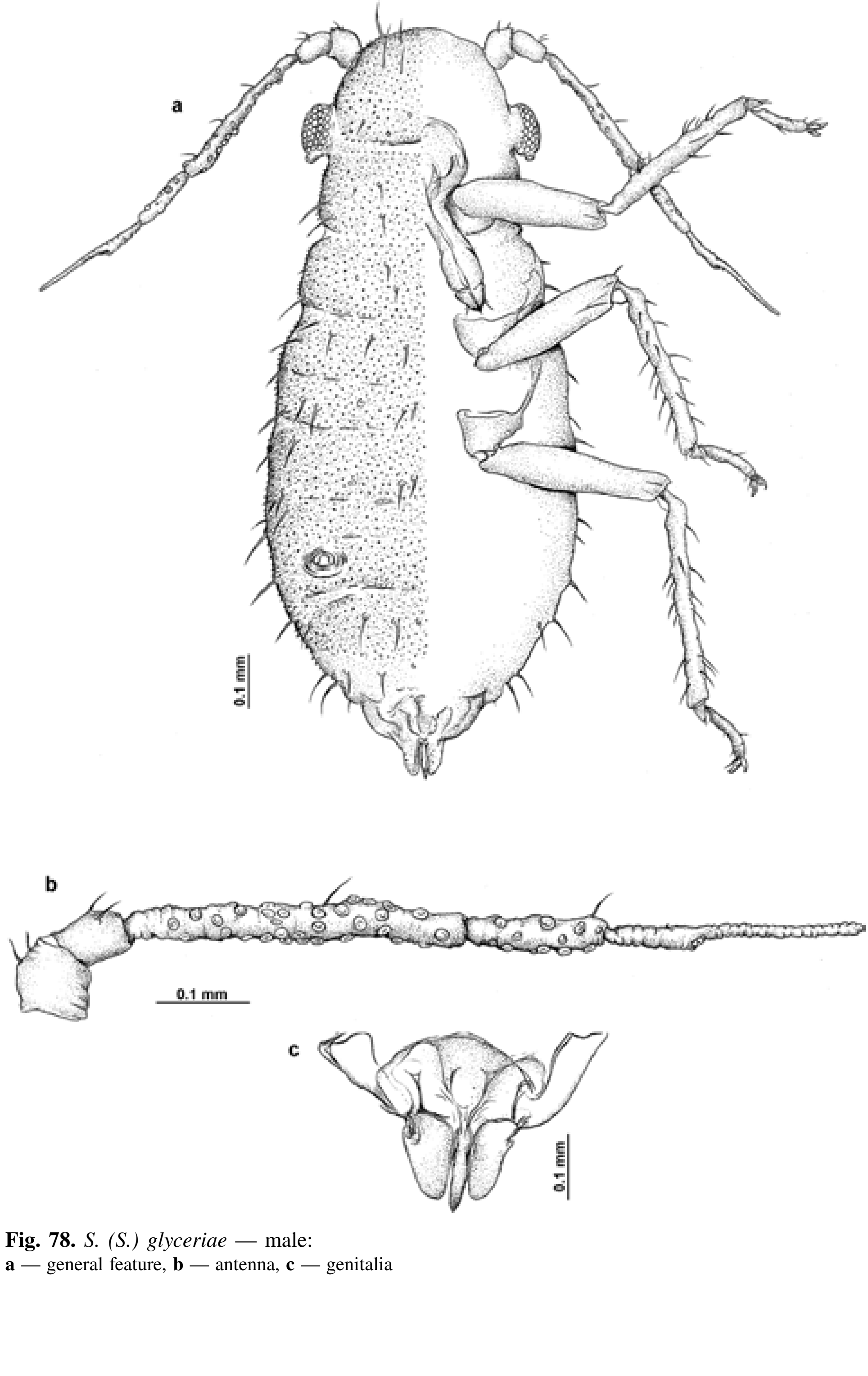


Fig. 78. *S. (S.) glyceriae* — male:
a — general feature, **b** — antenna, **c** — genitalia

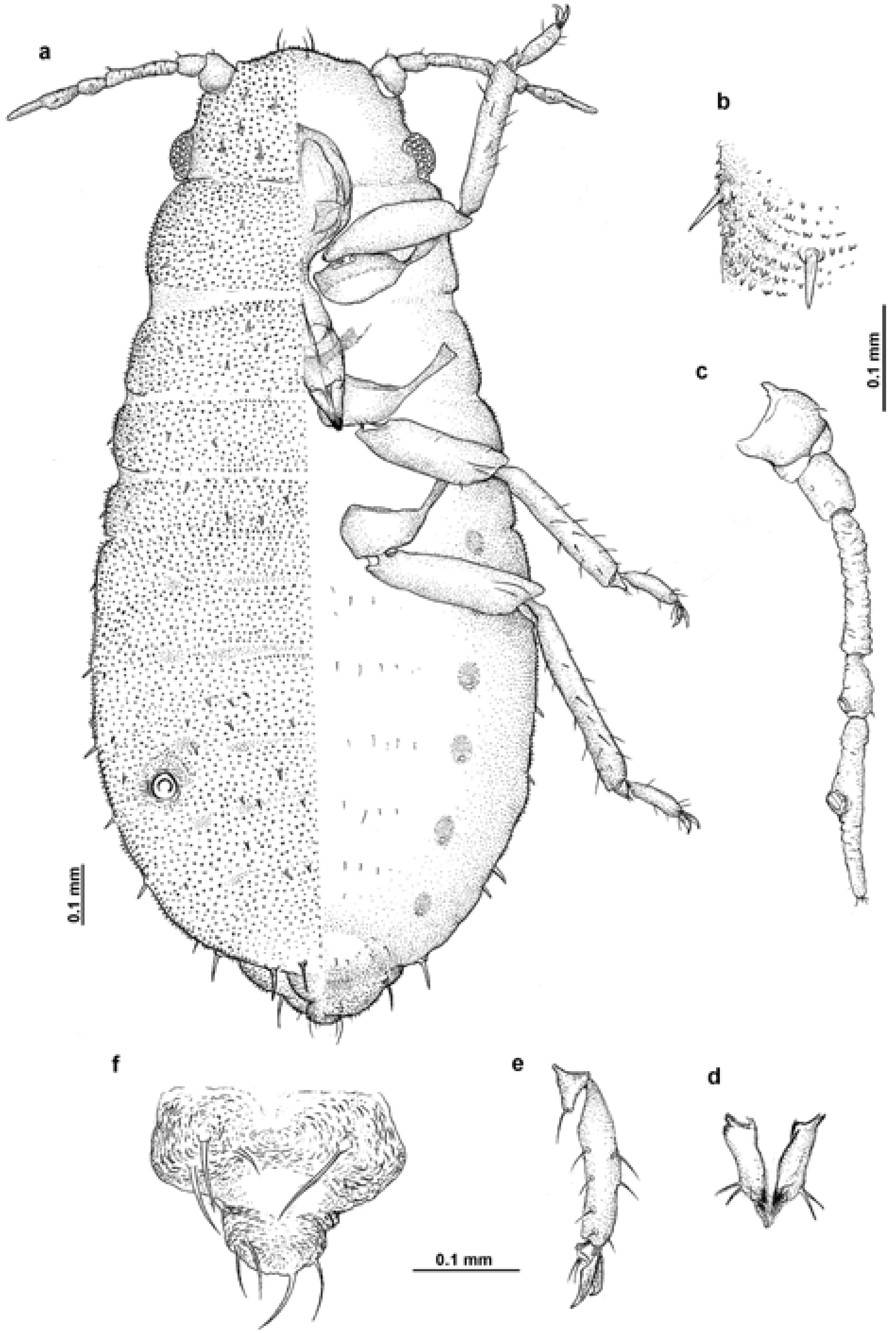


Fig. 79. *S. (S.) littoralis* — apterous viviparous female:
a — general feature, **b** — sculpture, **c** — antenna, **d** — apical segment of rostrum, **e** — hind tarsus, **f** — cauda

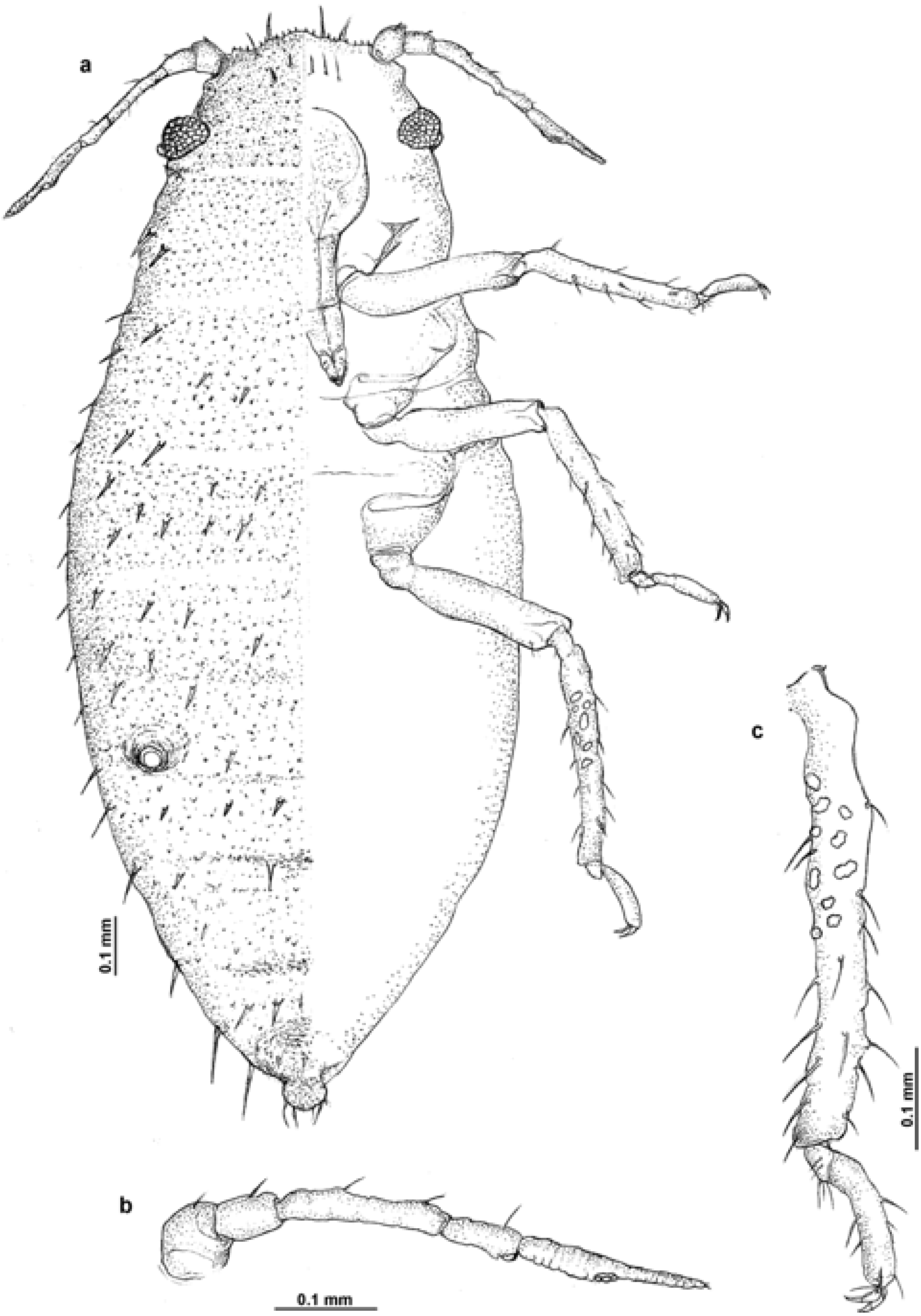


Fig. 80. *S. (S.) littoralis* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

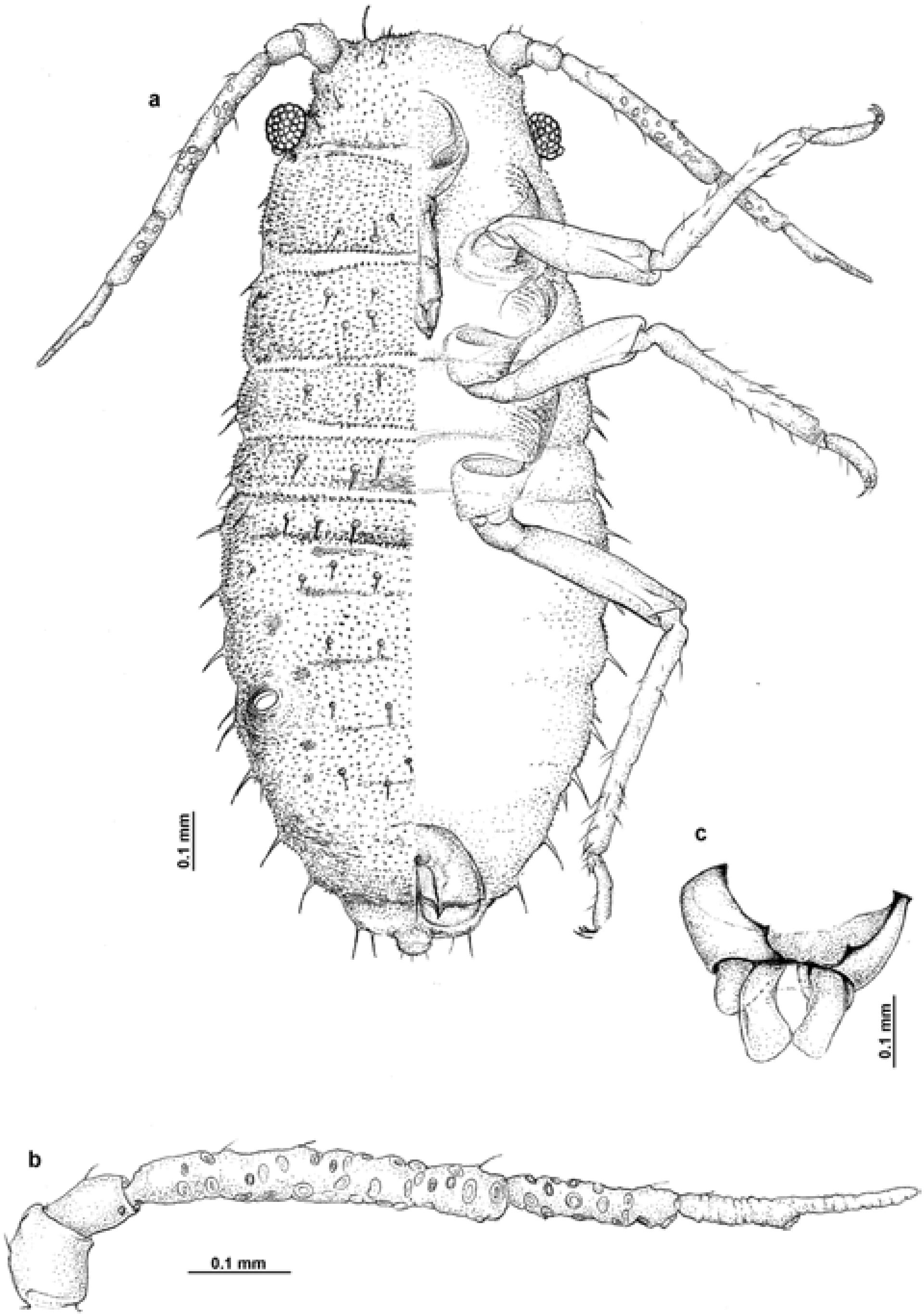


Fig. 81. *S. (S.) littoralis* — male:
a — general feature, **b** — antenna, **c** — genitalia

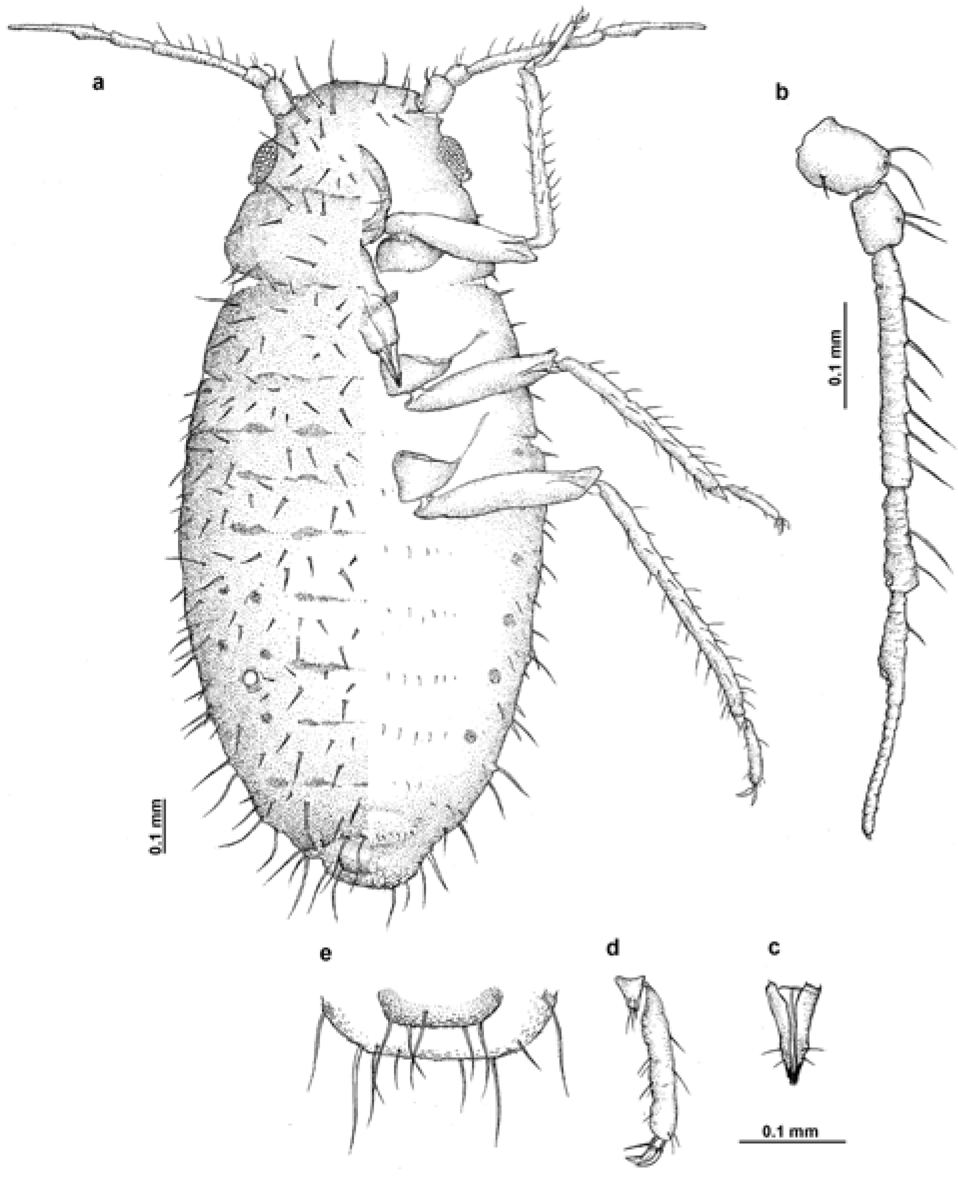


Fig. 82. *S. (R.) arenarii* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — cauda

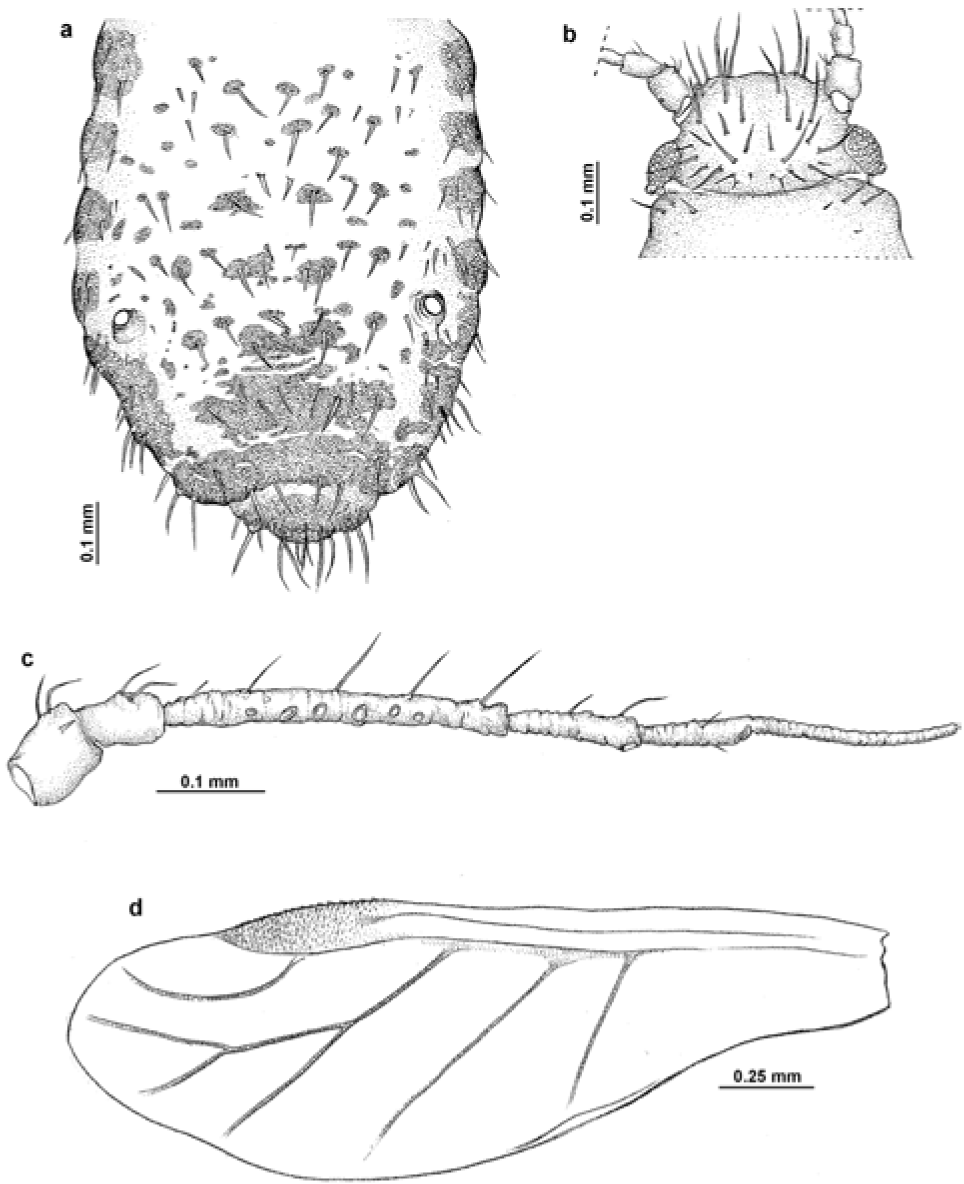


Fig. 83. *S. (R.) arenarii* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

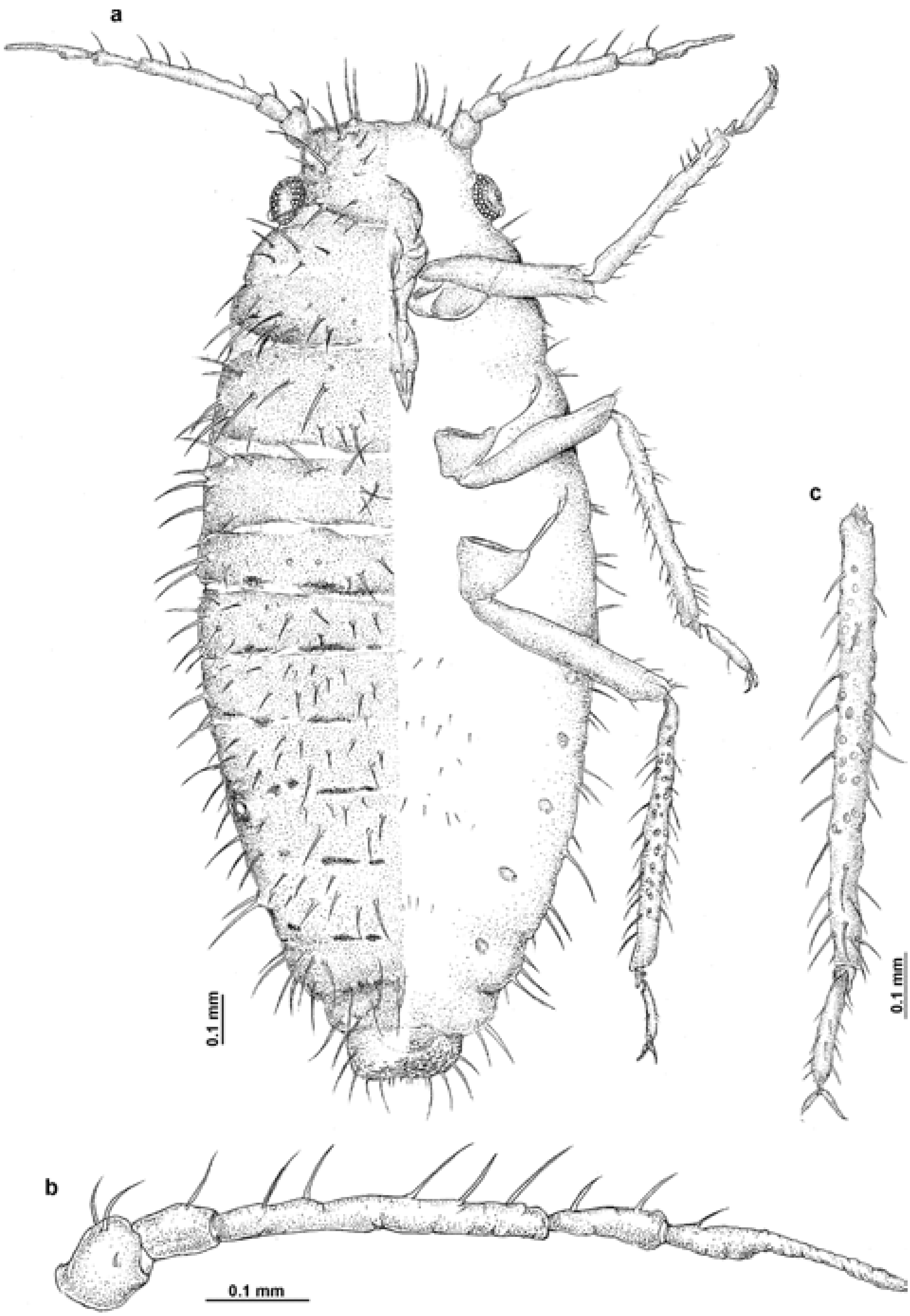


Fig. 84. *S. (R.) arenarii* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

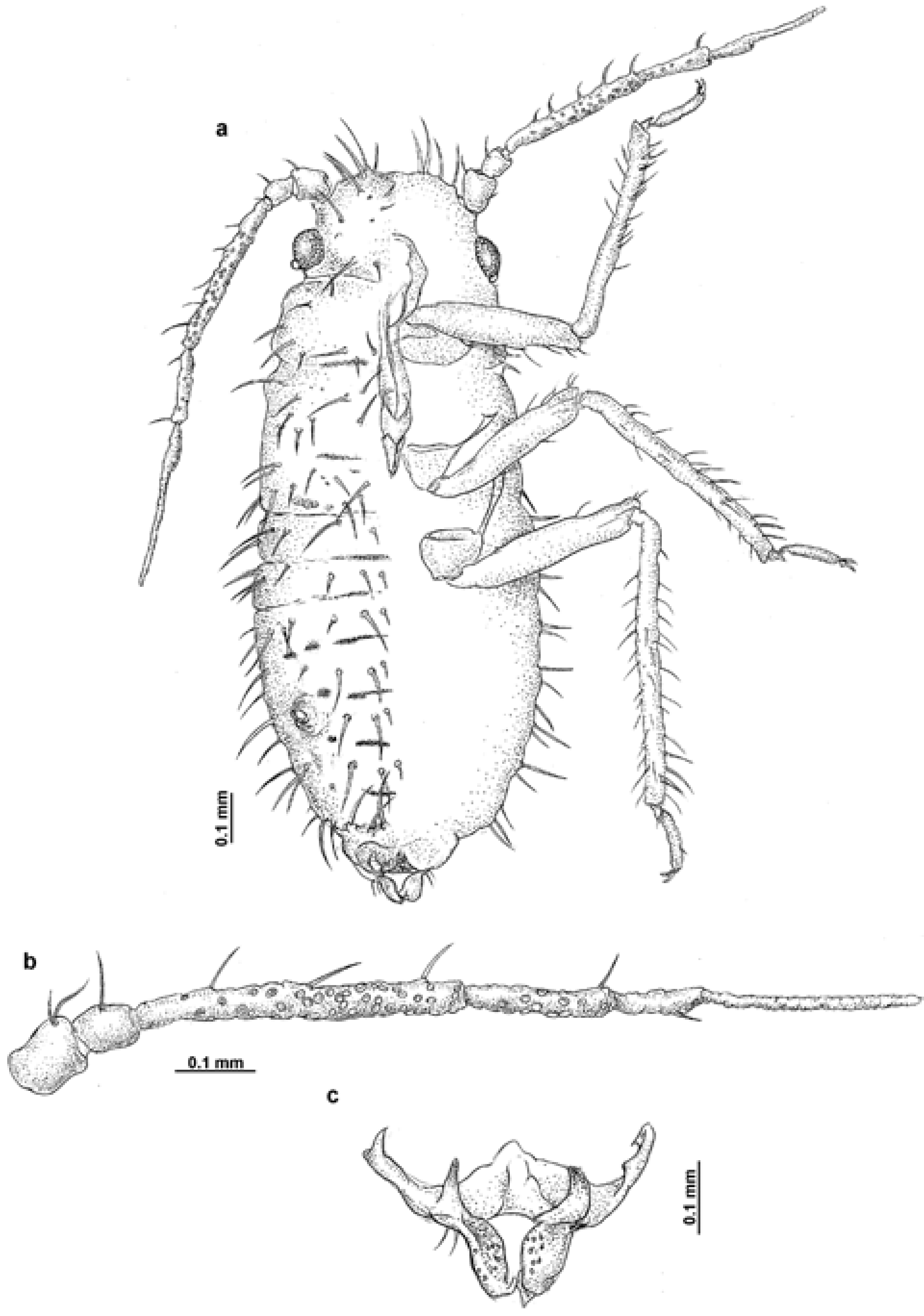


Fig. 85. *S. (R.) arenarii* — male:
a — general feature, **b** — antenna, **c** — genitalia

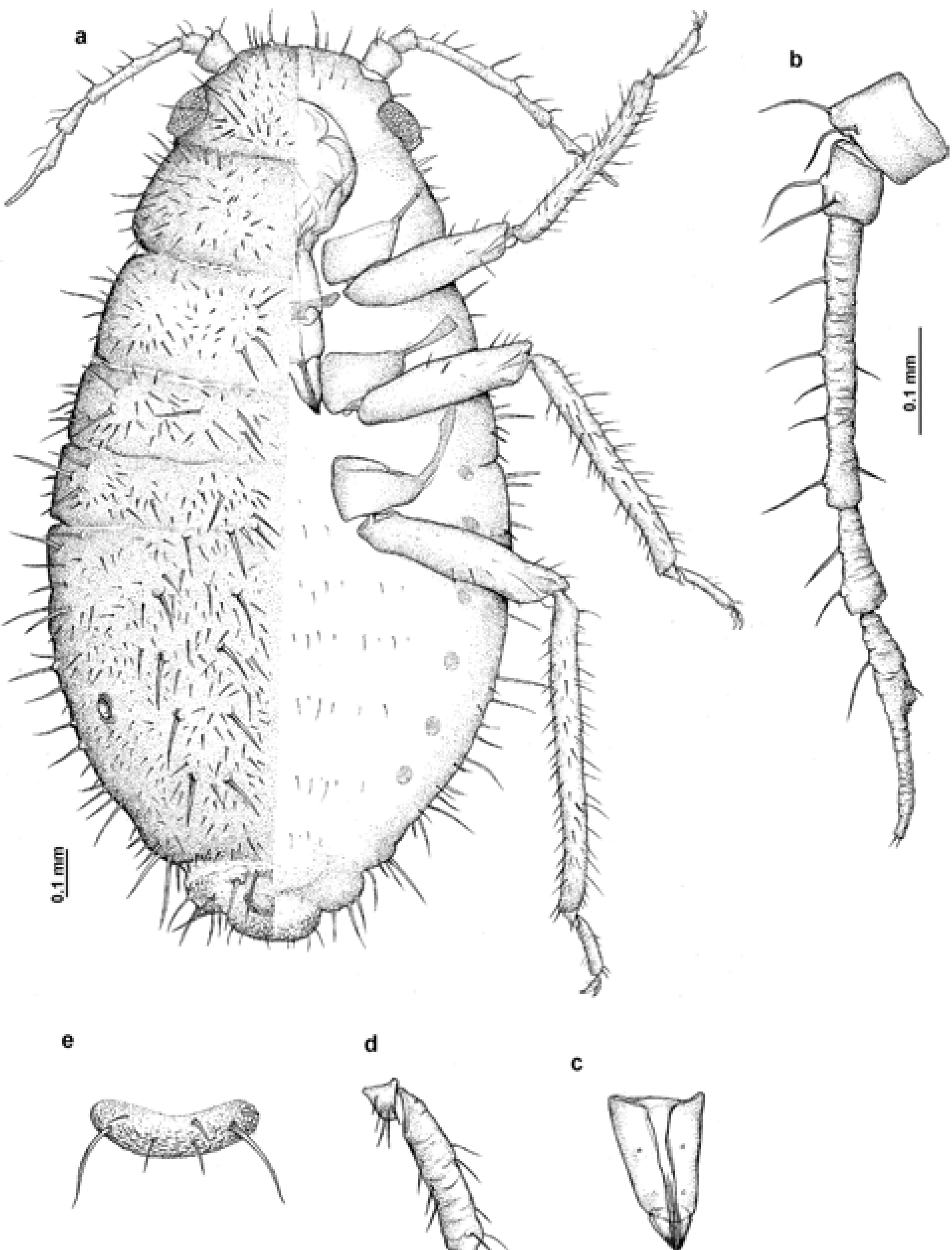


Fig. 86. *S. (R.) burakowskii* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — cauda

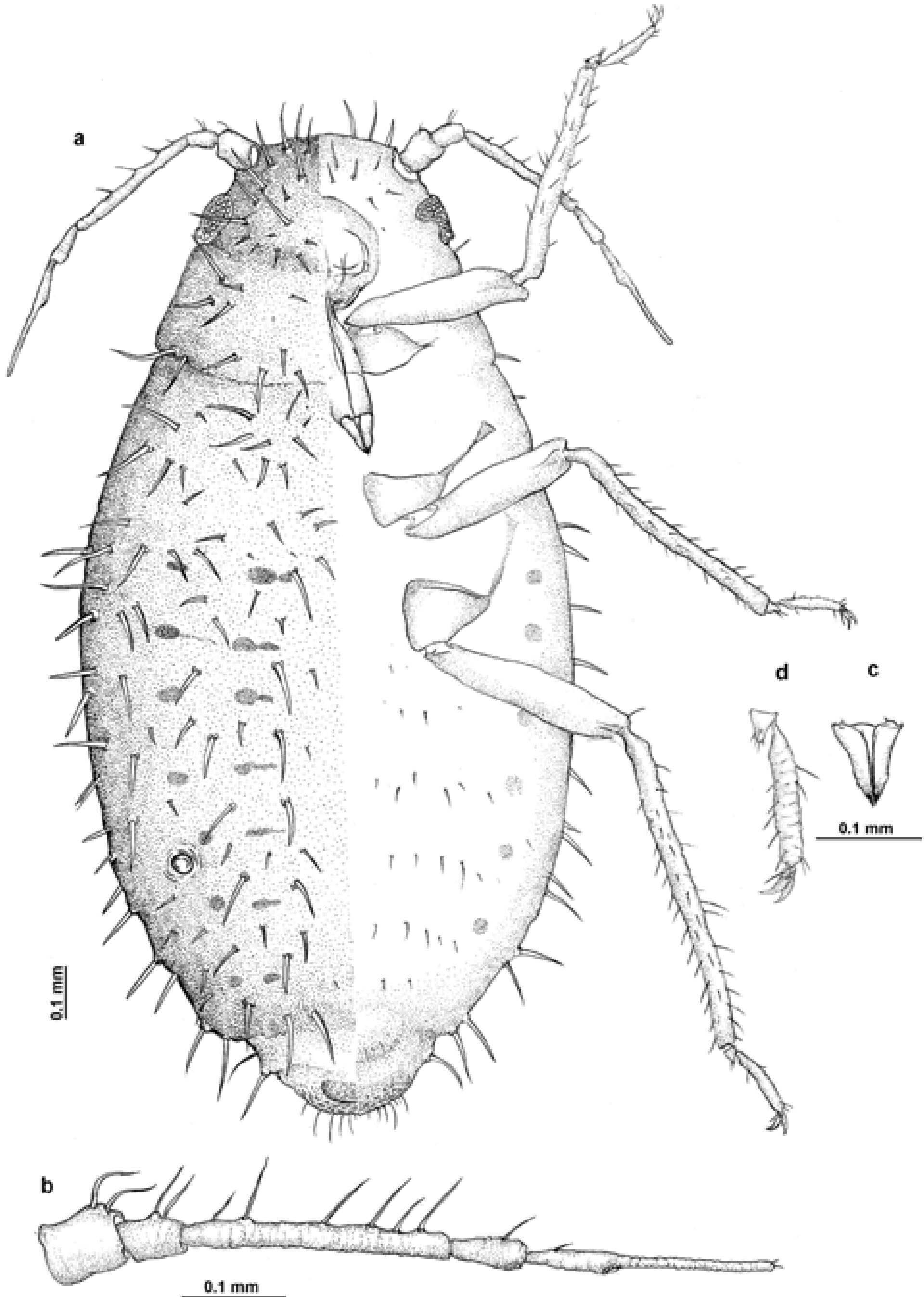


Fig. 87. *S. (R.) elegans* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus

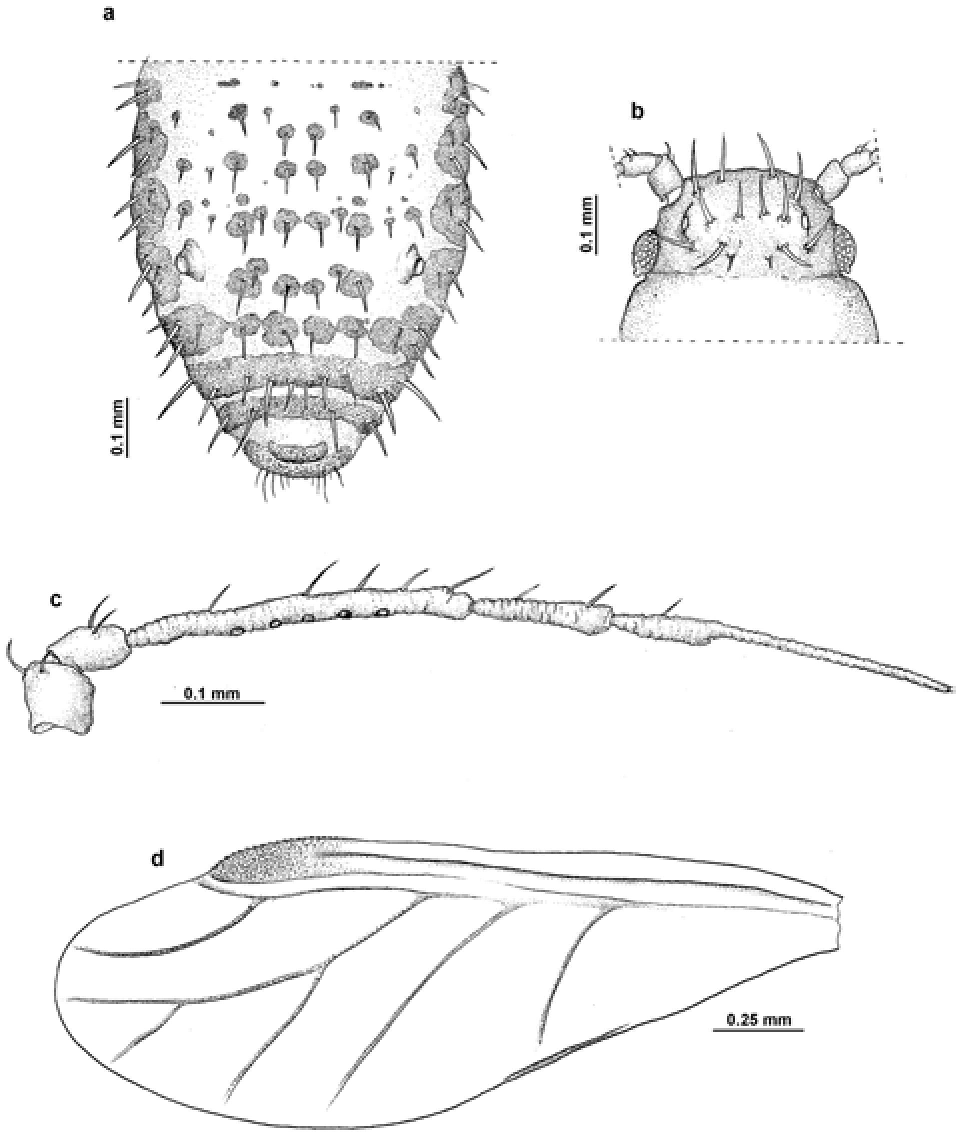


Fig. 88. *S. (R.) elegans* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

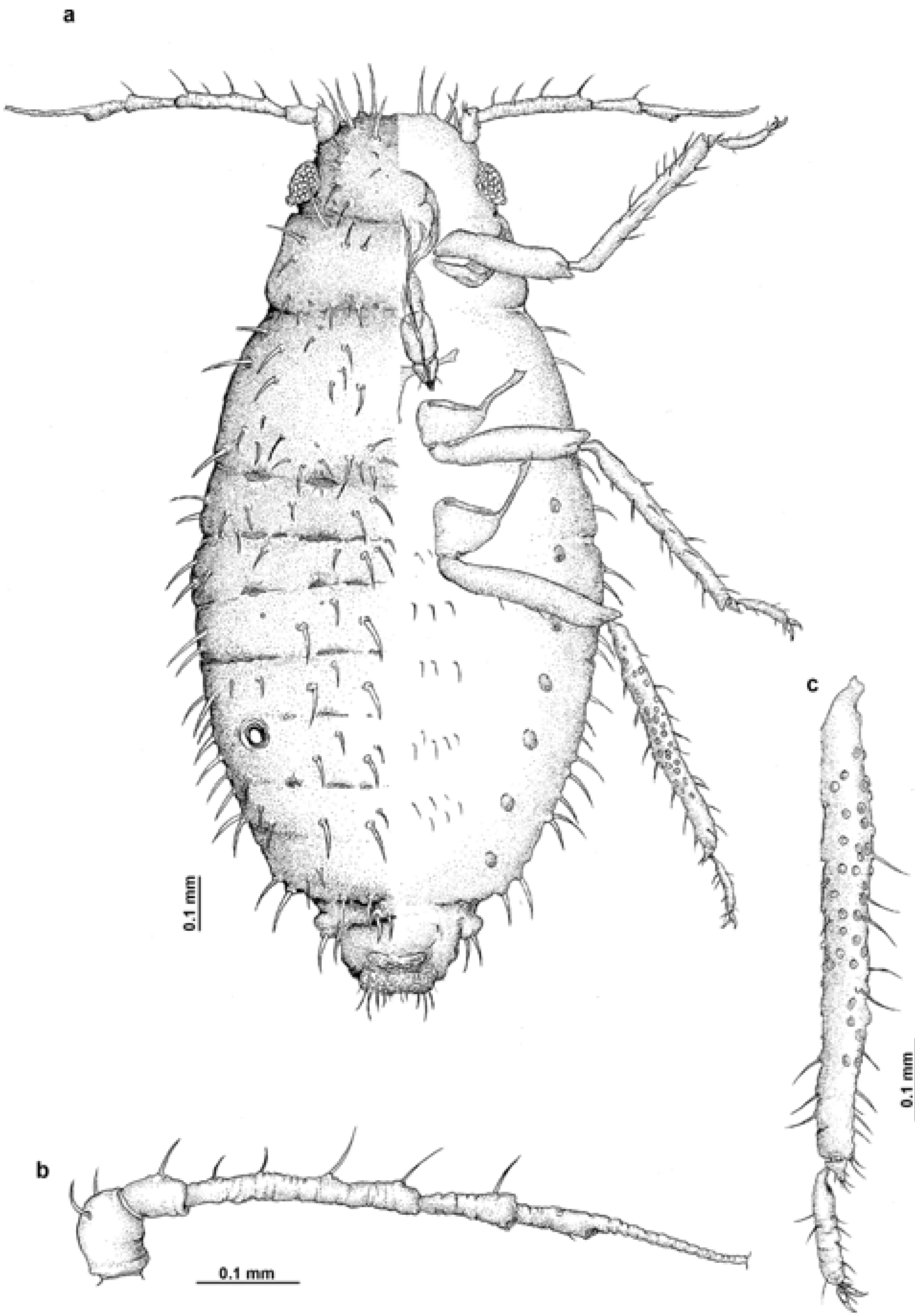


Fig. 89. *S. (R.) elegans* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

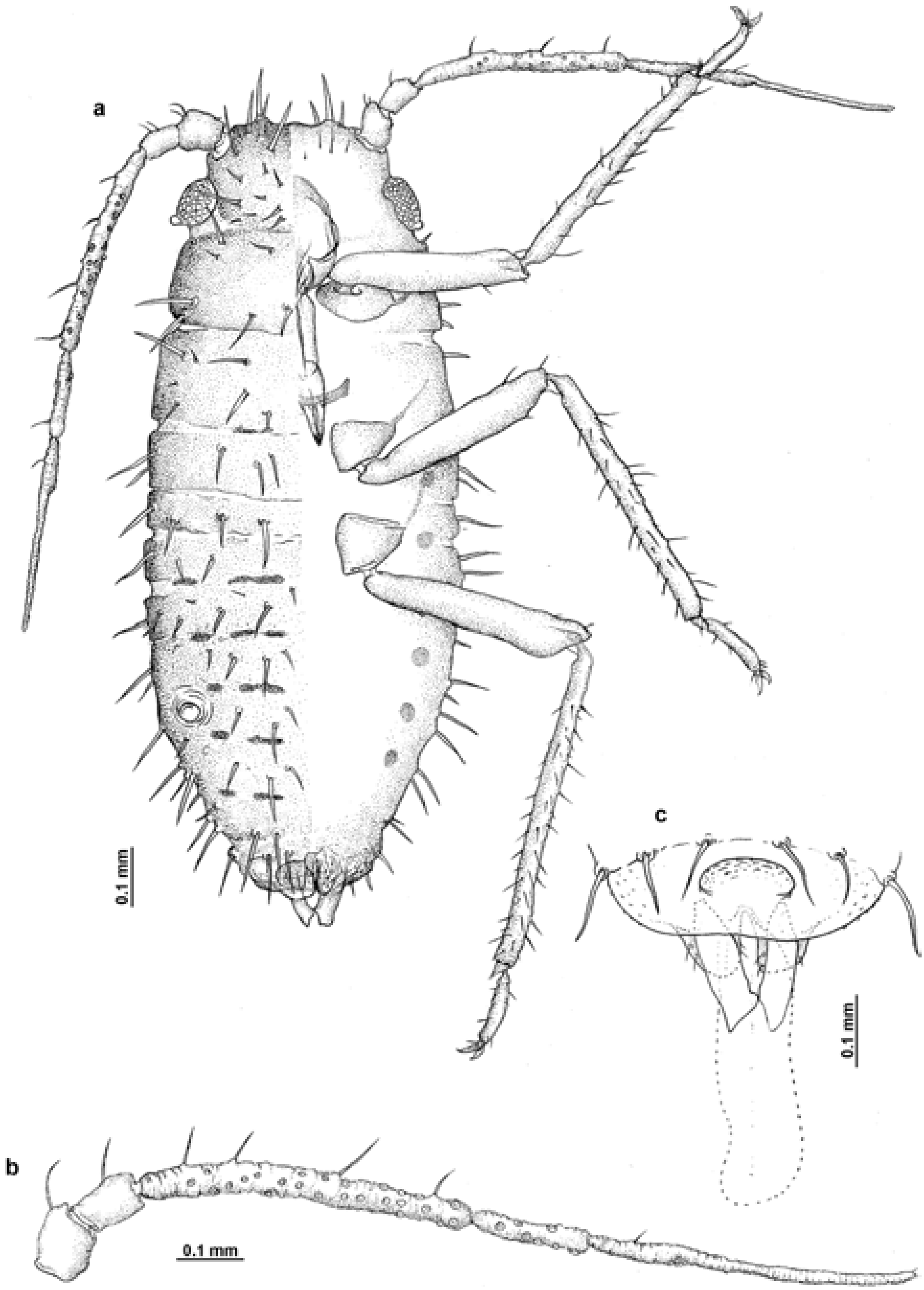


Fig. 90. *S. (R.) elegans* — male:
a — general feature, **b** — antenna, **c** — genitalia

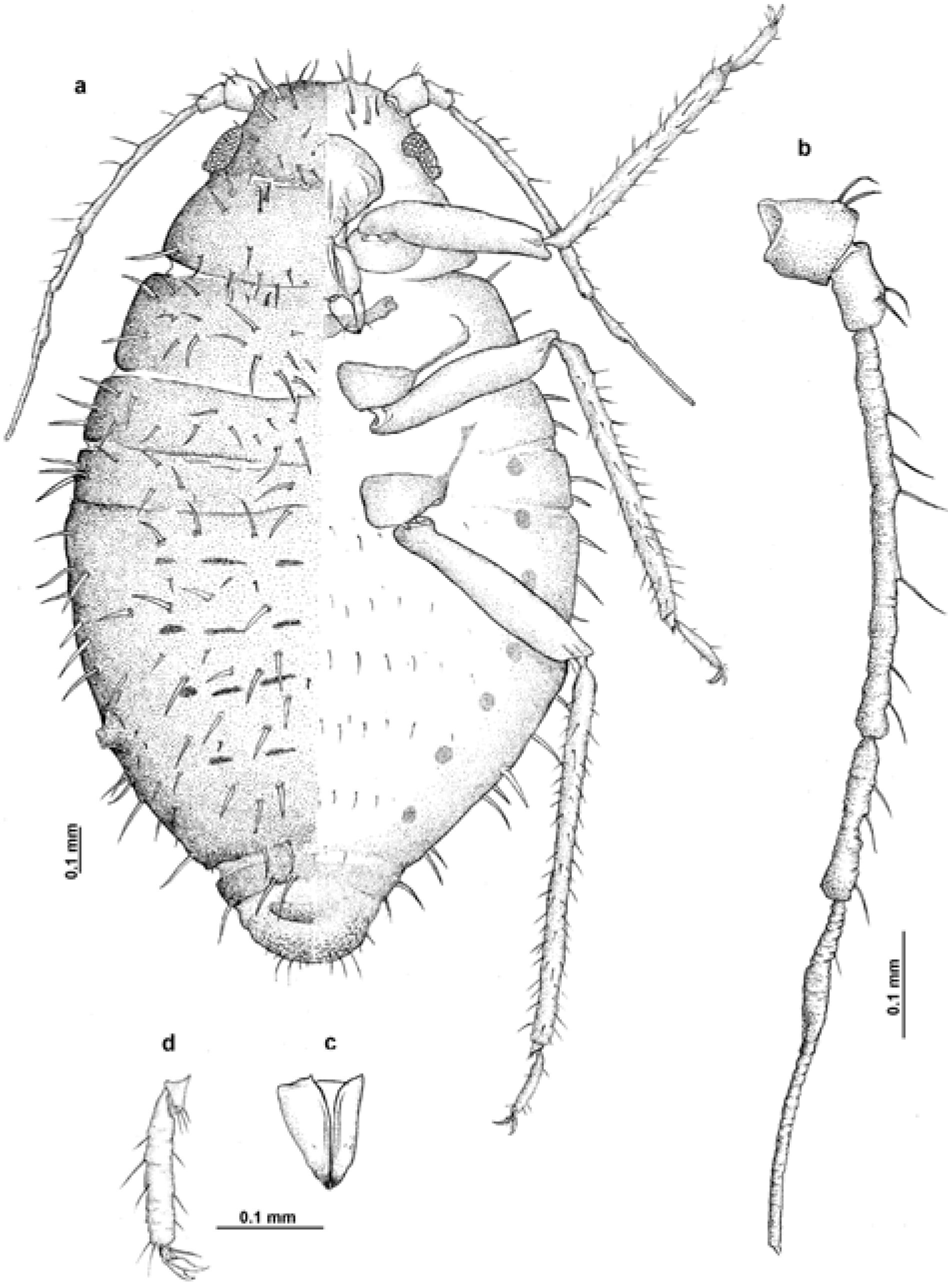


Fig. 91. *S. (R.) maydis* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus

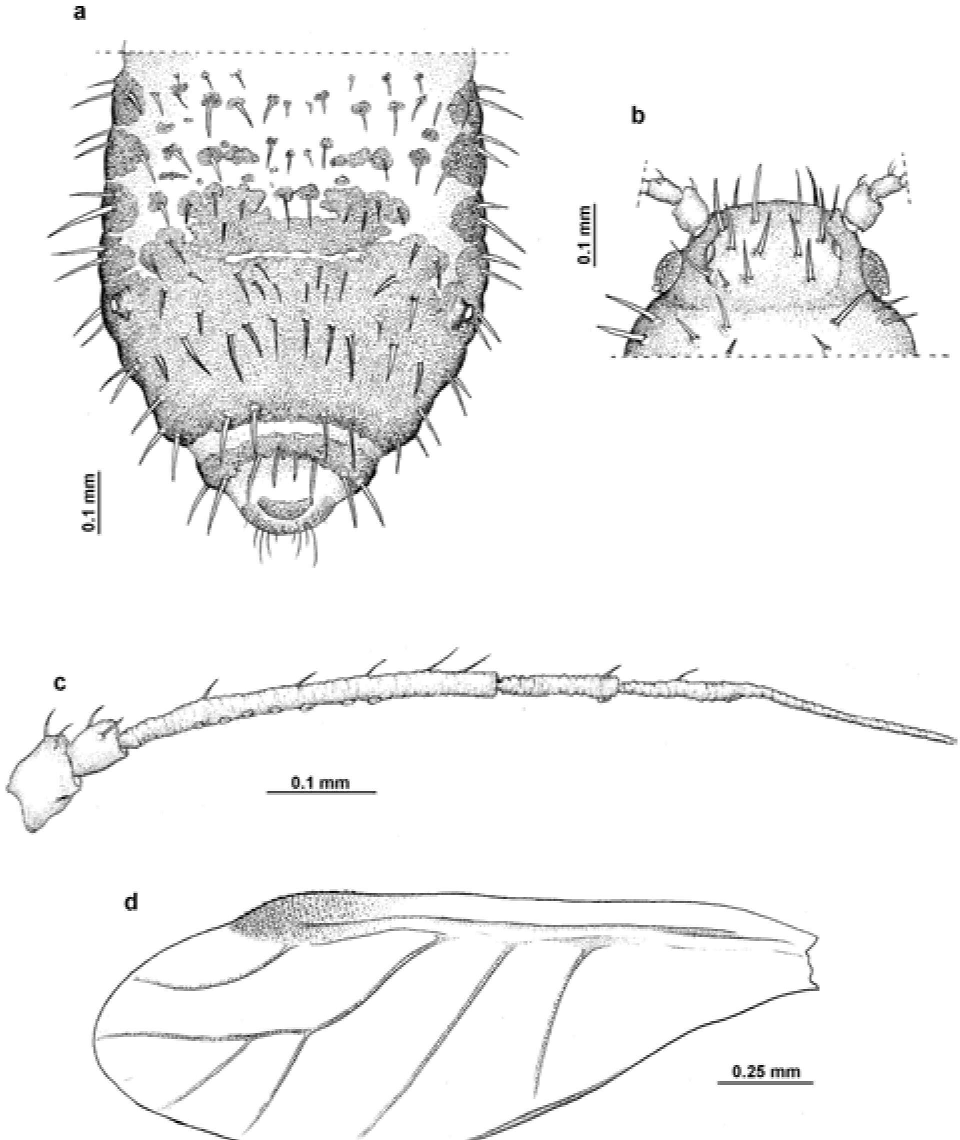


Fig. 92. *S. (R.) maydis* — alate viviparous female:
a — abdomen, **b** — head, **c** — antenna, **d** — fore wing

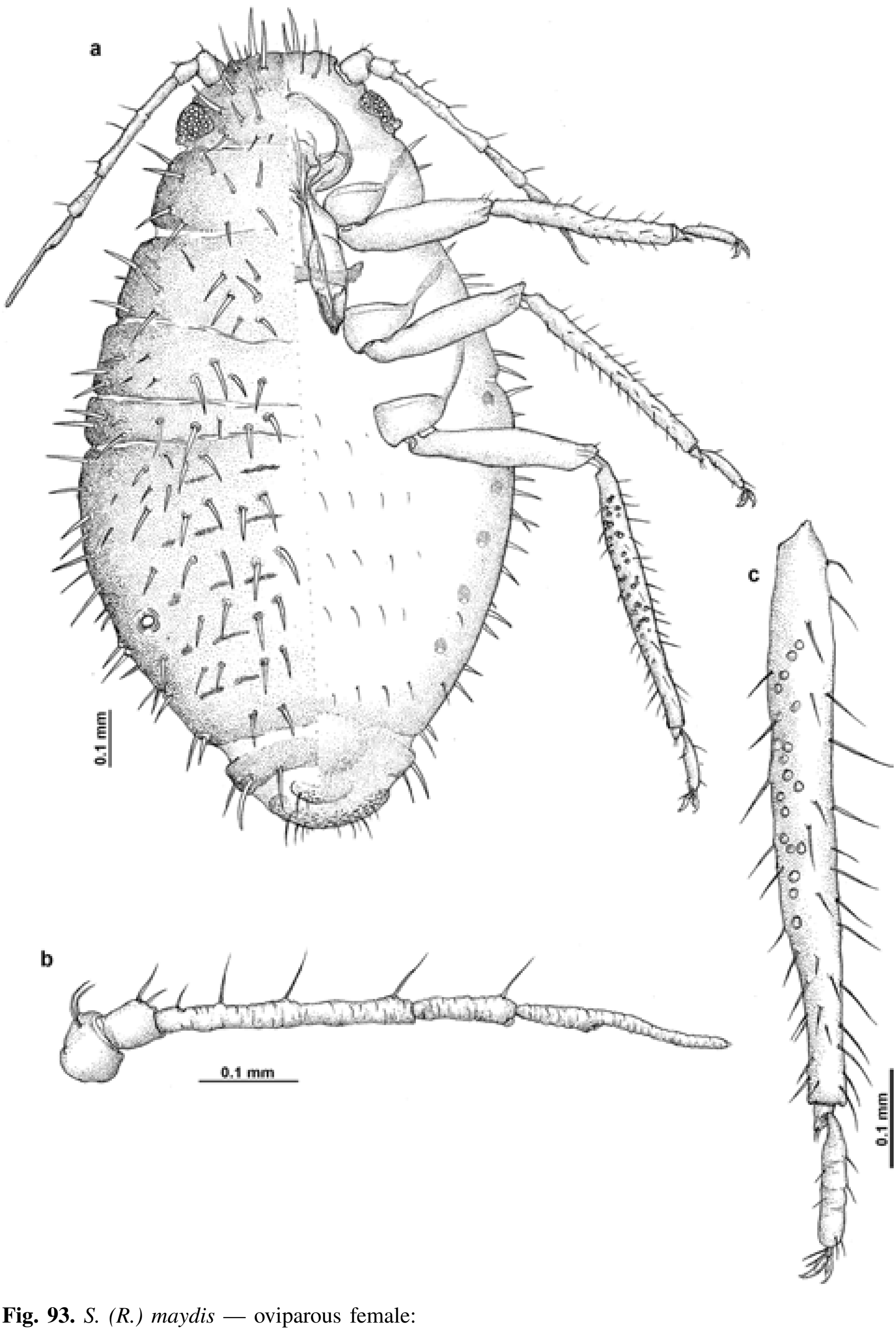


Fig. 93. *S. (R.) maydis* — oviparous female:
a — general feature, **b** — antenna, **c** — hind tibia and tarsus

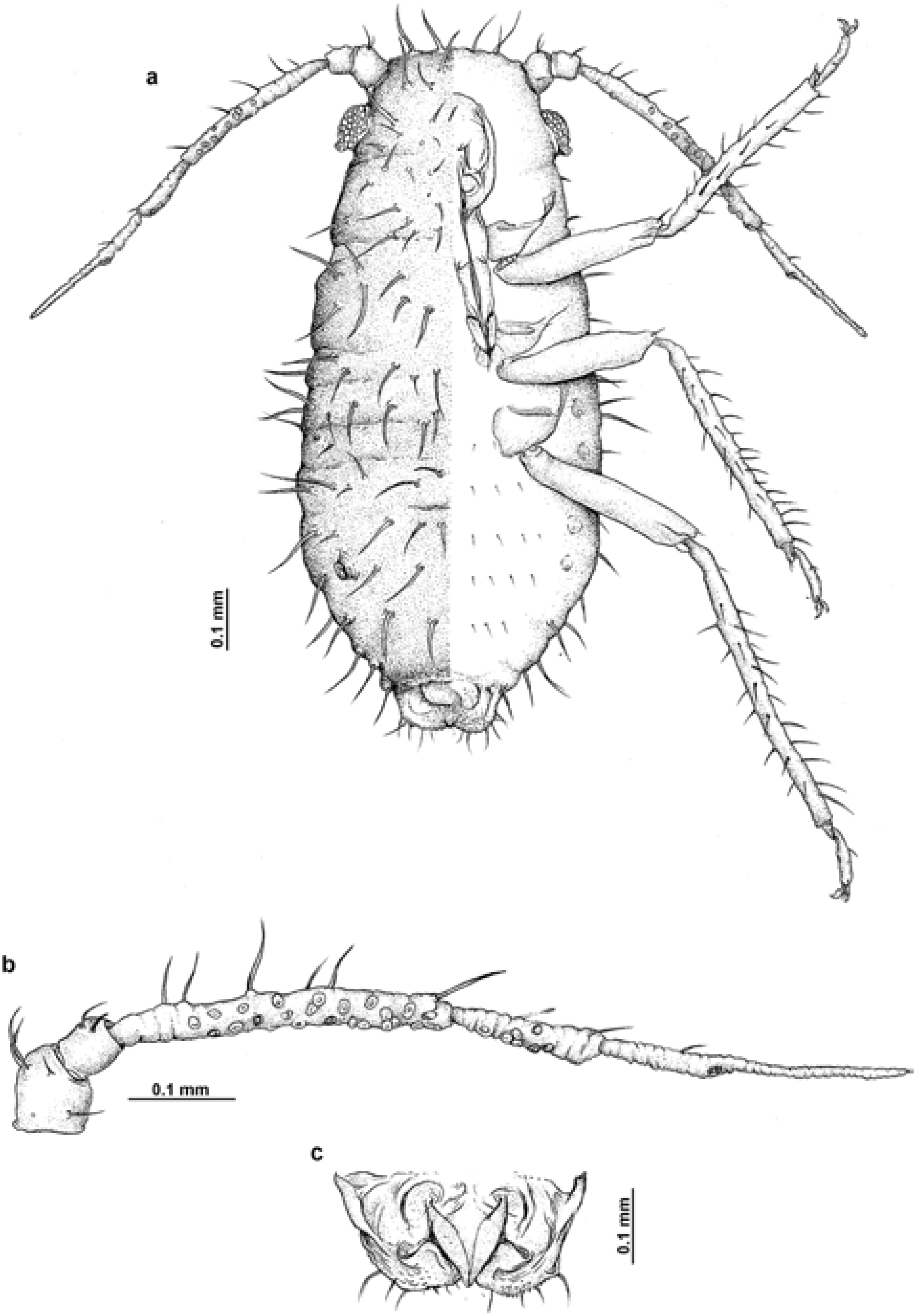


Fig. 94. *S. (R.) maydis* — male:
a — general feature, **b** — antenna, **c** — genitalia

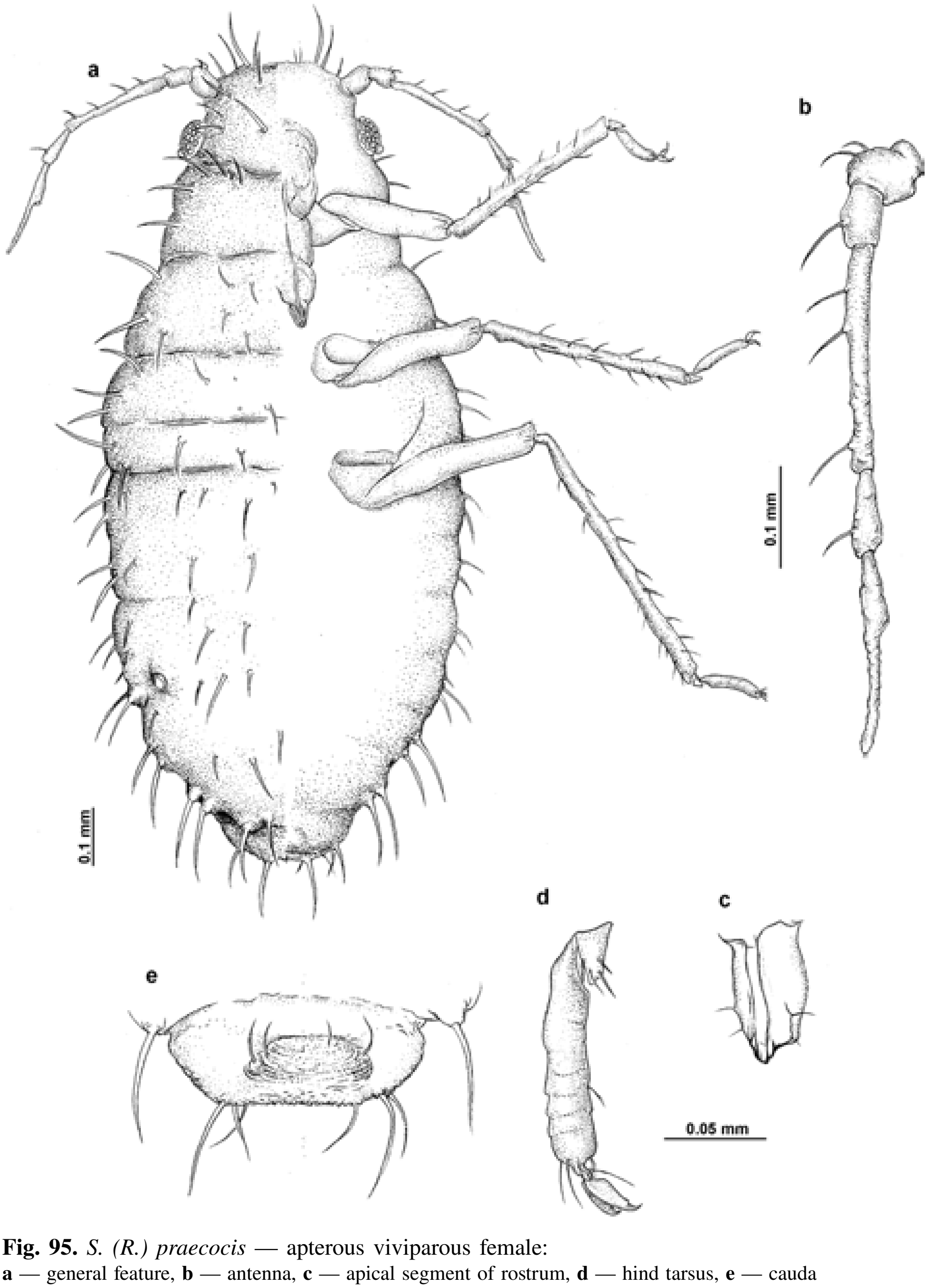


Fig. 95. *S. (R.) praecocis* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — cauda

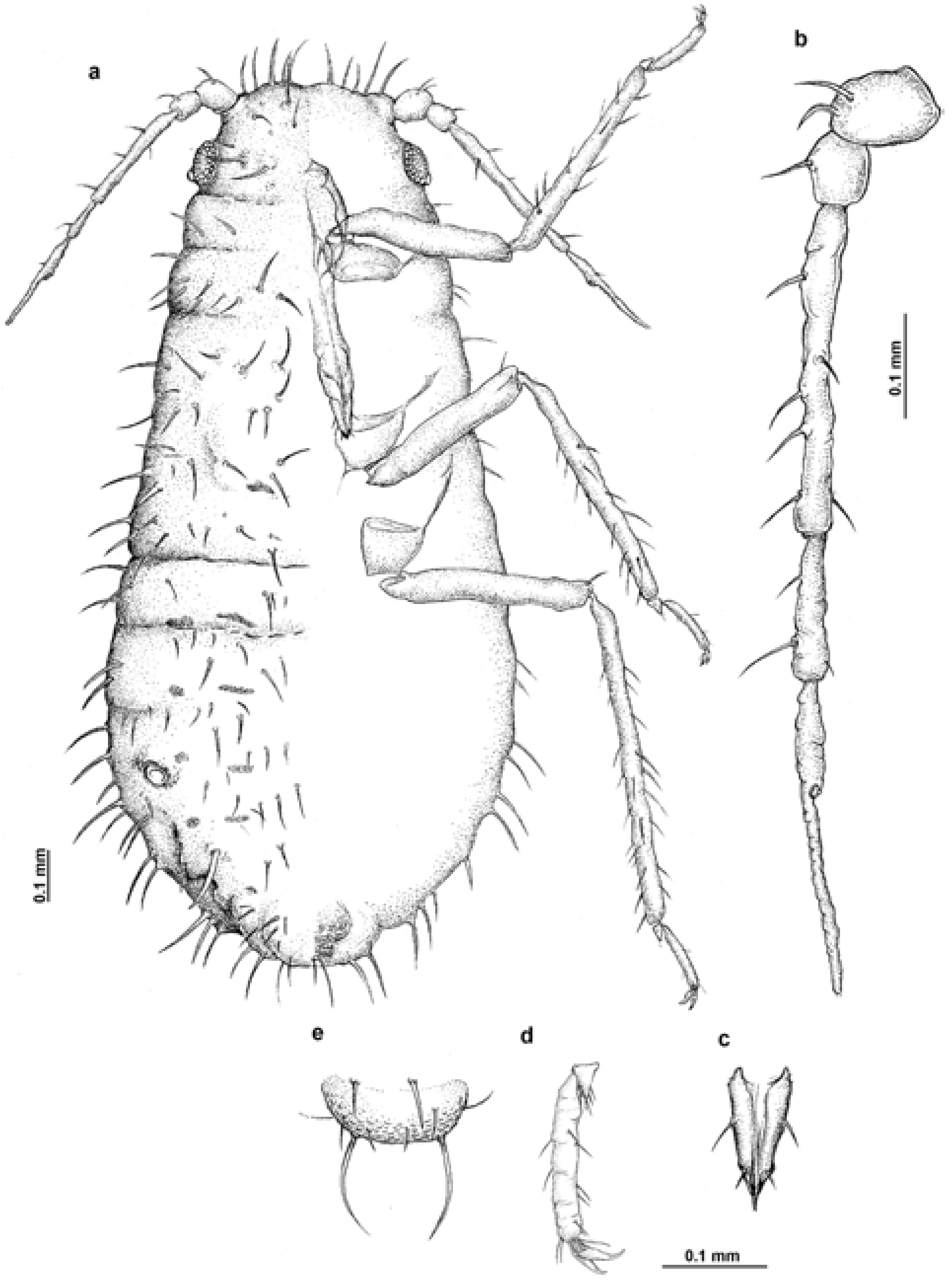


Fig. 96. *S. (R.) taurica* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — cauda

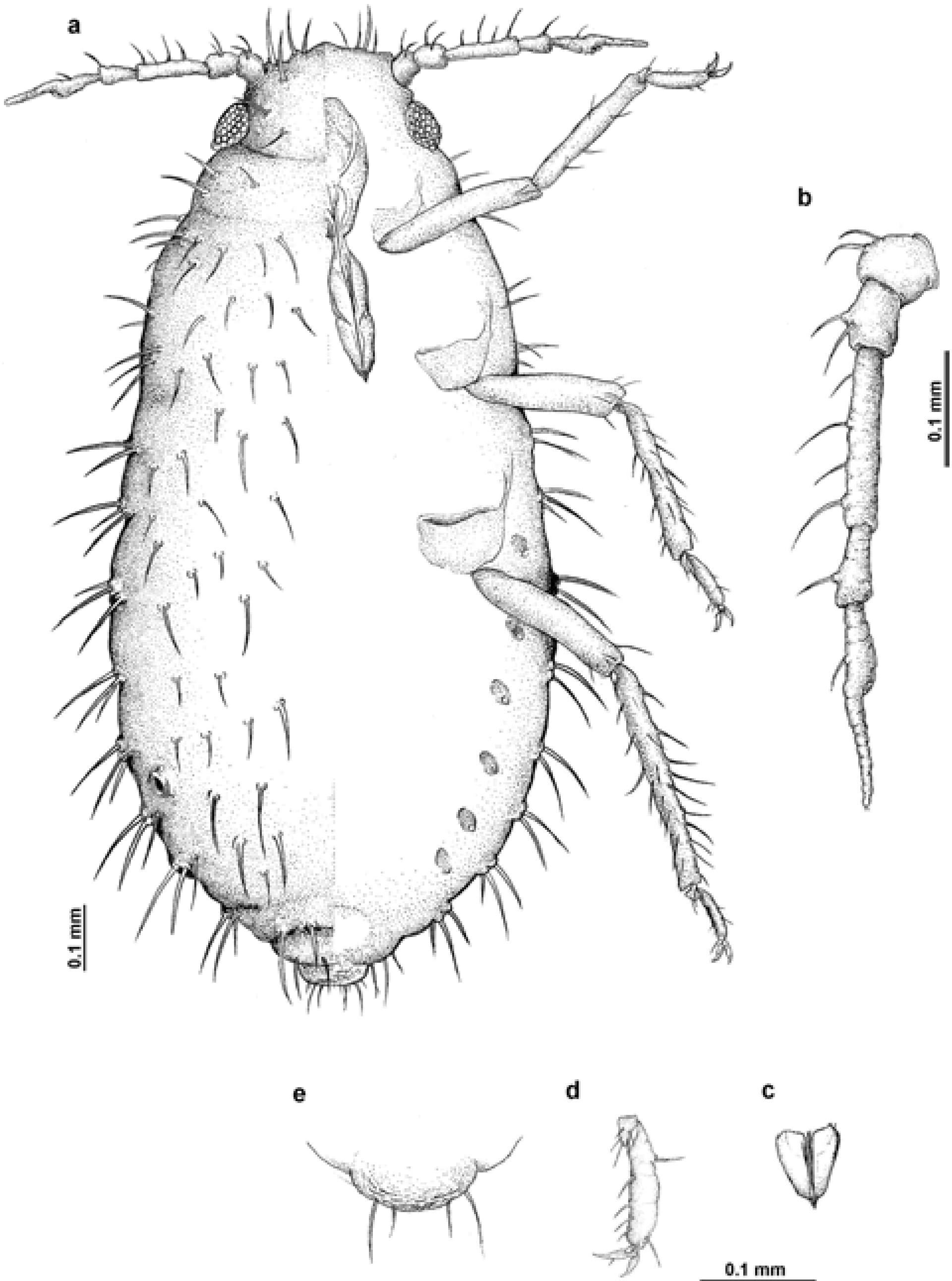


Fig. 97. *S. (R.) uvarovi* — apterous viviparous female:
a — general feature, **b** — antenna, **c** — apical segment of rostrum, **d** — hind tarsus, **e** — cauda

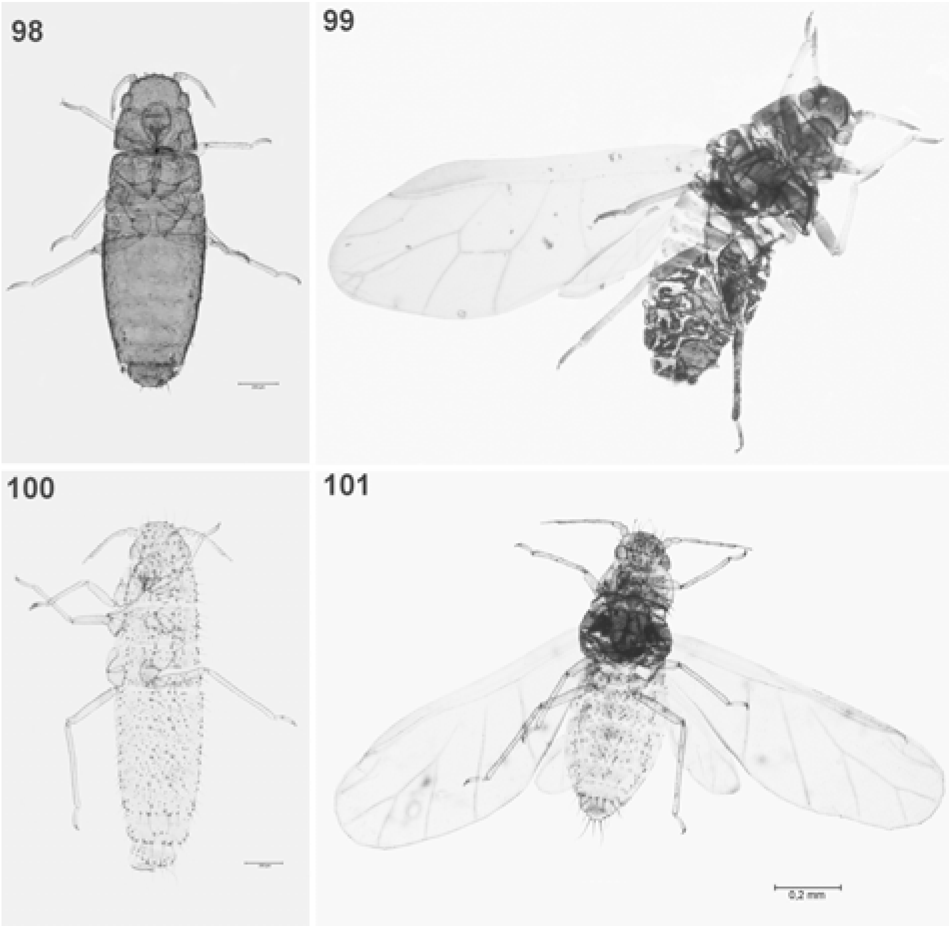


Fig. 98. *A. brevicornis* — apterous viviparous female
Fig. 99. *A. brevicornis* — alate viviparous female
Fig. 100. *A. doncasteri* — apterous viviparous female
Fig. 101. *A. doncasteri* — alate viviparous female

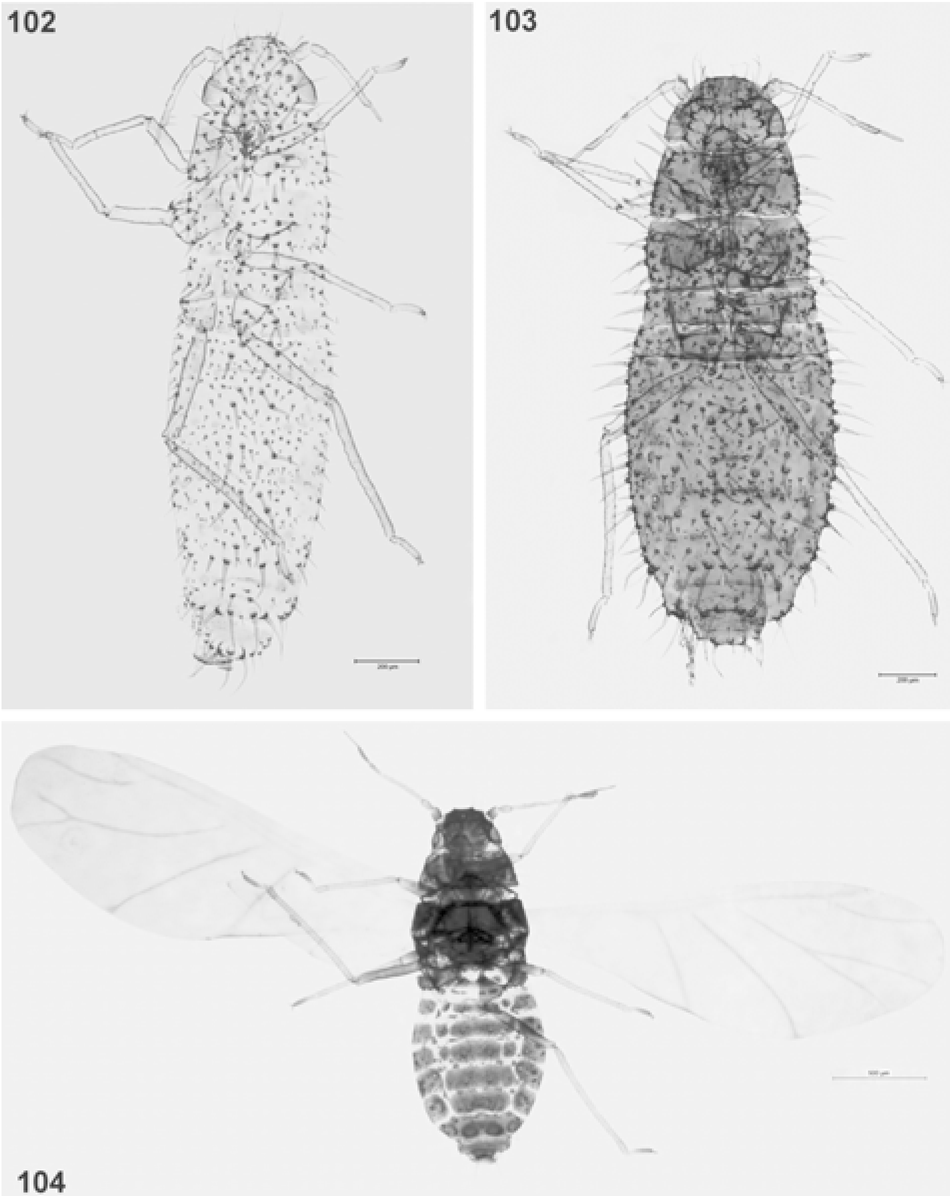


Fig. 102. *A. doncasteri* — oviparous female
Fig. 103. *A. hirtellus* — apterous viviparous female
Fig. 104. *A. hirtellus* — alate viviparous female

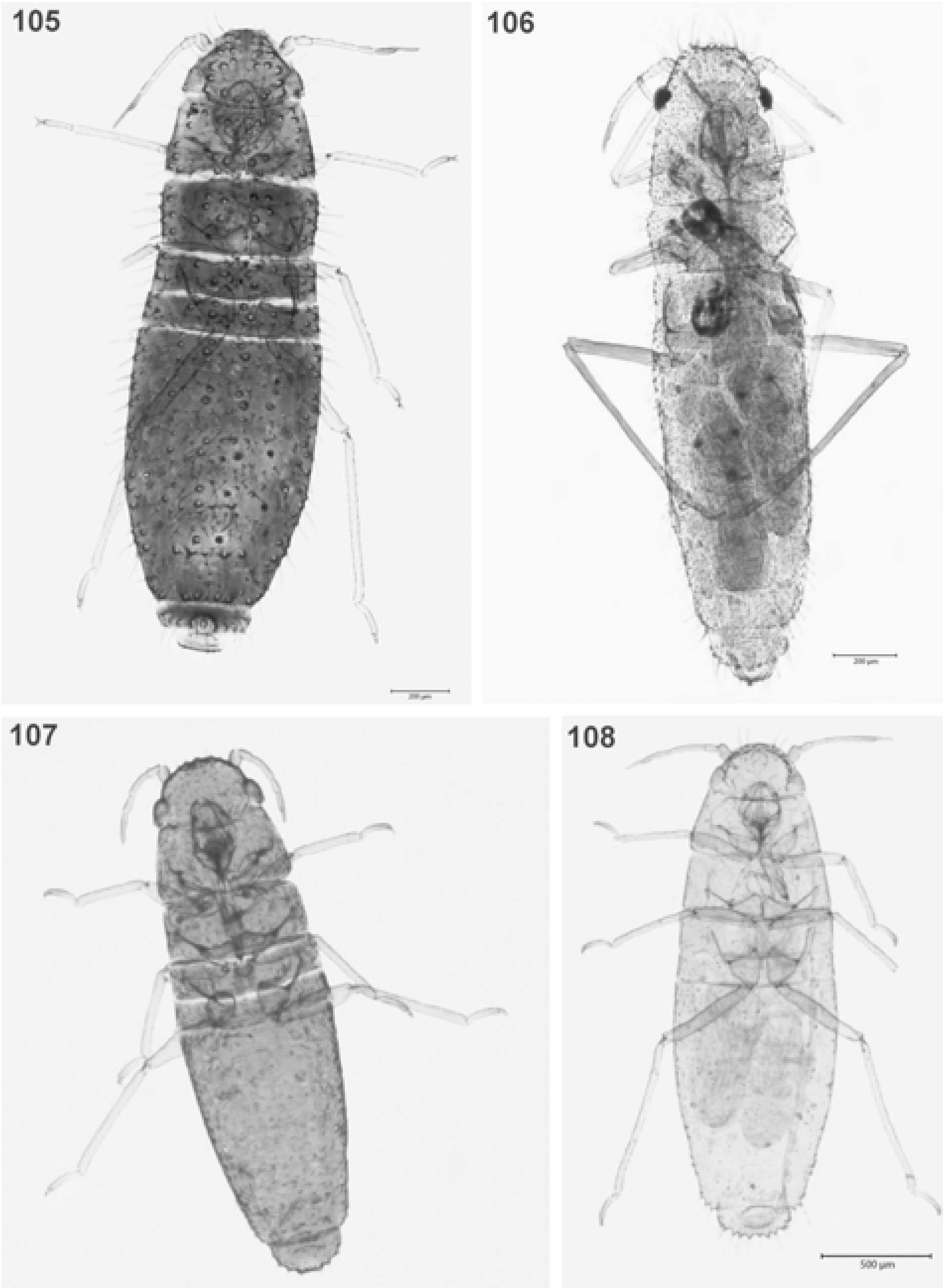


Fig. 105. *A. hirtellus* — oviparous female
Fig. 106. *A. karakumi* — apterous viviparous female
Fig. 107. *A. persianus* — apterous viviparous female
Fig. 108. *A. serrulatus* — apterous viviparous female

Fig. 109. *A. serrulatus* — alate viviparous female
Fig. 110. *A. serrulatus* — oviparous female
Fig. 111. *A. serrulatus* — male

Fig. 112. *C. paniculatae* — apterous viviparous female
Fig. 113. *C. paniculatae* — alate viviparous female
Fig. 114. *C. paniculatae* — oviparous female
Fig. 115. *C. paniculatae* — male

Fig. 116. *Ch. berlesei* — apterous viviparous female
Fig. 117. *Ch. berlesei* — alate viviparous female
Fig. 118. *Ch. berlesei* — oviparous female

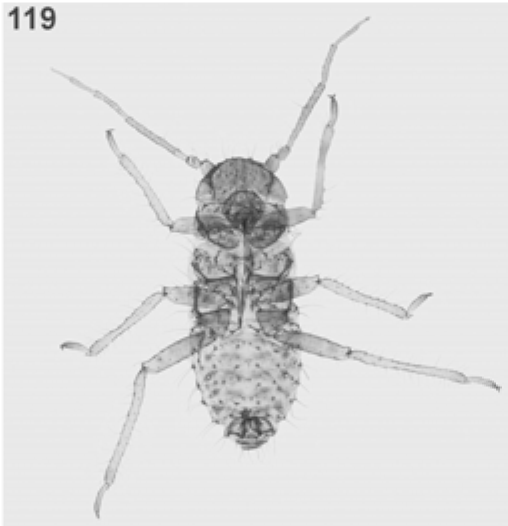


Fig. 119. *Ch. berlesei* — male
Fig. 120. *Ch. longirostris* — apterous viviparous female
Fig. 121. *Ch. longirostris* — alate viviparous female

Fig. 122. *Ch. massagetica* — apterous viviparous female
Fig. 123. *Ch. stipae* — apterous viviparous female
Fig. 124. *Ch. stipae* — alate viviparous female

Fig. 125. *Ch. stipae* — oviparous female
Fig. 126. *Ch. stipae* — male
Fig. 127. *Ch. stipae* subsp. *setosa* — apterous viviparous female
Fig. 128. *Ch. stipae* subsp. *setosa* — alate viviparous female

Fig. 129. *Ch. stipae* subsp. *setosa* — oviparous female
Fig. 130. *Ch. stipae* subsp. *setosa* — male
Fig. 131. *Ch. tshernavini* — apterous viviparous female
Fig. 132. *Ch. tshernavini* — alate viviparous female

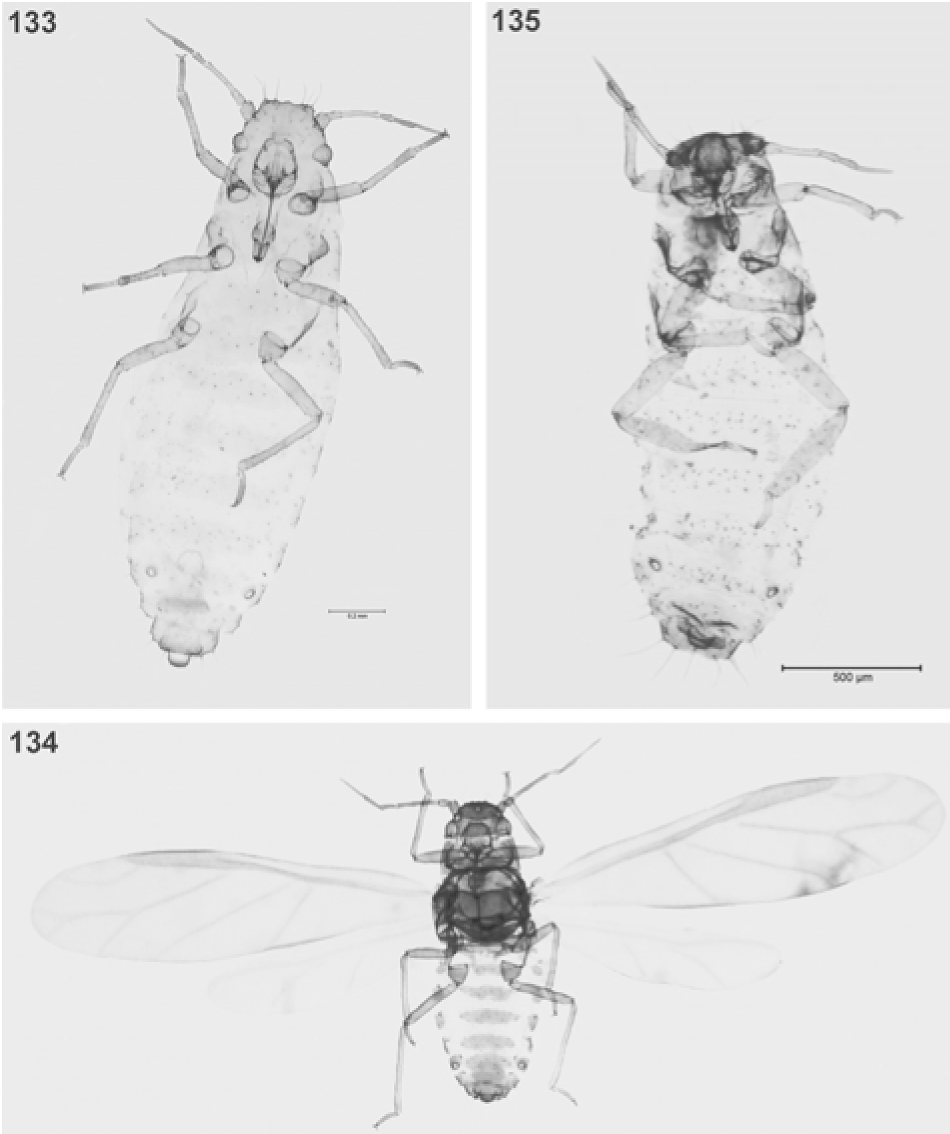


Fig. 133. *L. psammae* — apterous viviparous female
Fig. 134. *L. psammae* — alate viviparous female
Fig. 135. *L. psammae* — oviparous female

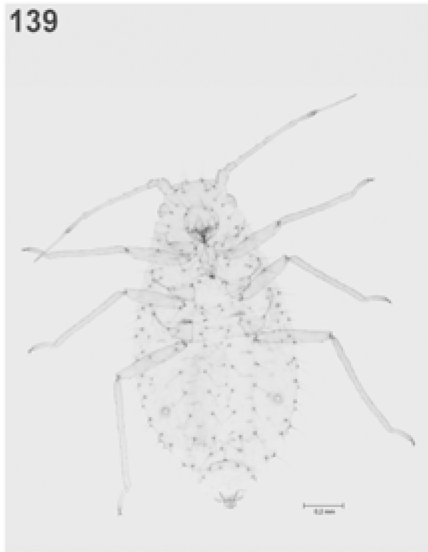


Fig. 136. *L. psammae* — male
Fig. 137. *S. (S.) agropyronensis* — apterous viviparous female
Fig. 138. *S. (S.) agropyronensis* — alate viviparous female
Fig. 139. *S. (S.) flava* — apterous viviparous female

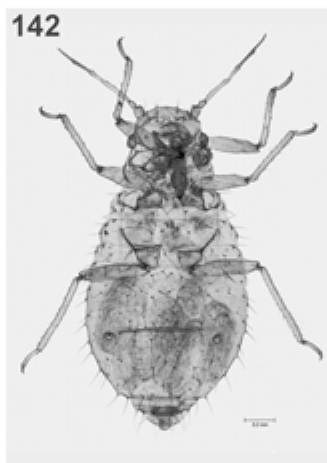


Fig. 140. *S. (S.) flava* — alate viviparous female
Fig. 141. *S. (S.) flava* — oviparous female
Fig. 142. *S. (S.) glyceriae* — apterous viviparous female

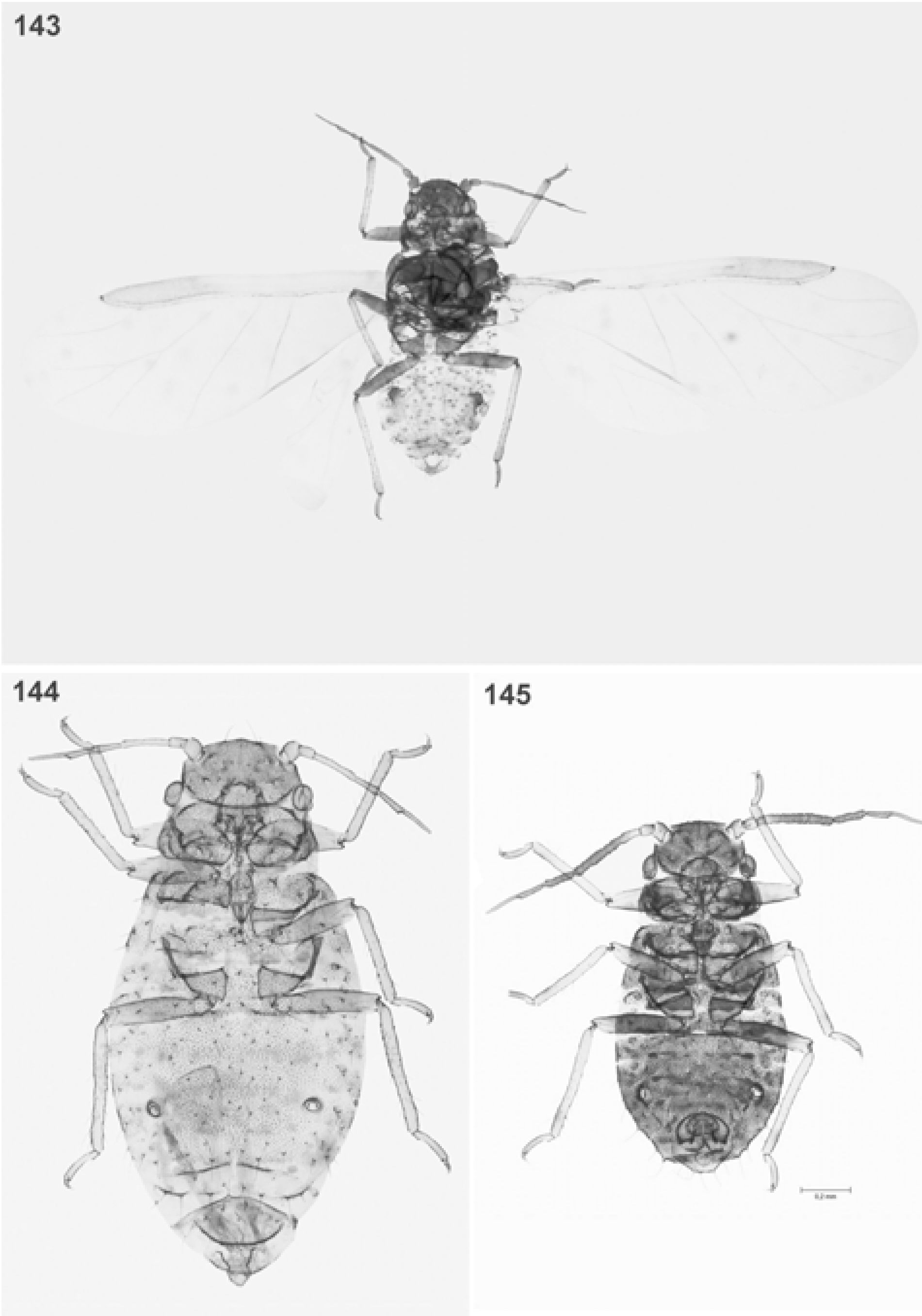


Fig. 143. *S. (S.) glyceriae* — alate viviparous female
Fig. 144. *S. (S.) glyceriae* — oviparous female
Fig. 145. *S. (S.) glyceriae* — male

Fig. 146. *S. (S.) littoralis* — apterous viviparous female
Fig. 147. *S. (S.) littoralis* — oviparous female
Fig. 148. *S. (S.) littoralis* — male
Fig. 149. *S. (R.) arenarii* — apterous viviparous female

Fig. 150. *S. (R.) arenarii* — alate viviparous female
Fig. 151. *S. (R.) arenarii* — oviparous female
Fig. 152. *S. (R.) arenarii* — male

Fig. 153. *S. (R.) burakowskii* — apterous viviparous female
Fig. 154. *S. (R.) elegans* — apterous viviparous female
Fig. 155. *S. (R.) elegans* — alate viviparous female

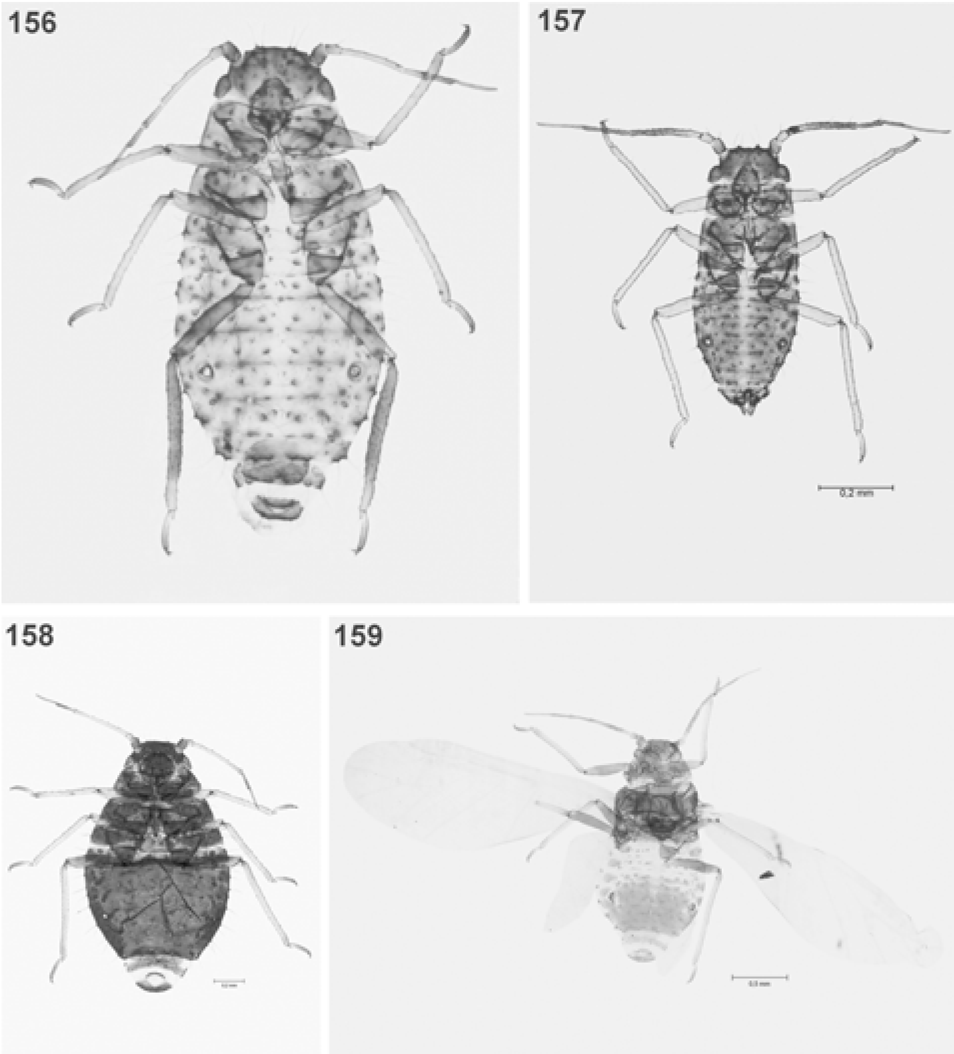


Fig. 156. *S. (R.) elegans* — oviparous female
Fig. 157. *S. (R.) elegans* — male
Fig. 158. *S. (R.) maydis* — apterous viviparous female
Fig. 159. *S. (R.) maydis* — alate viviparous female



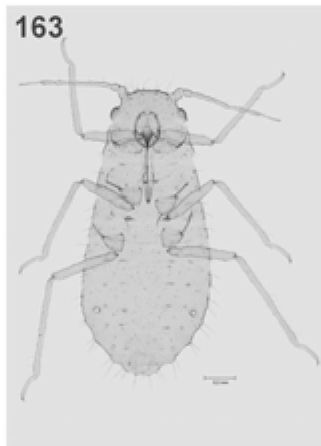
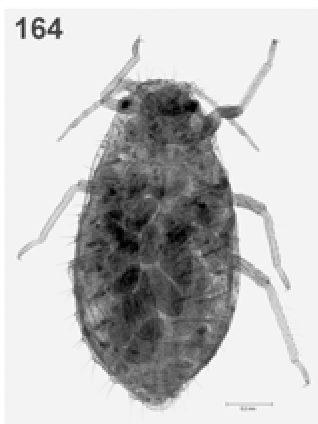




Fig. 160. *S. (R.) maydis* — oviparous female
Fig. 161. *S. (R.) maydis* — male
Fig. 162. *S. (R.) praecocis* — apterous viviparous female
Fig. 163. *S. (R.) taurica* — apterous viviparous female
Fig. 164. *S. (R.) uvarovi* — apterous viviparous female

List of host plants of Siphini (in alphabetical order of plant genera)

A host plant index has been compiled from the material studied (the slides deposited in the museal collections) and the literature cited including *Aphids on the World's Herbaceous Plants and Shrubs* (Blackman, Eastop 2006) and *Host Plant Catalog of Aphids* (Holman 2009).

Flowering plants and pteridophytes of Poland. A checklist (Mirek et al. 2002) and *CRC World Dictionary of Grasses* (Quattrocchi 2006) were used as a reference books of botanical nomenclature.

Plant species	Siphini
Cyperacea	
Carex acuta L.	*A. serrulatus*, *C. paniculatae*, *S. (S.) glyceriae*
Carex acutiformis Ehrh.	*A. serrulatus*, *L. psammae*
Carex brevicollis DC.	*C. paniculatae*
Carex brizoides L.	*C. paniculatae*
Carex canescens L.	*S. (S.) glyceriae*
Carex cinerea (Poll.) Dost.	*S. (S.) glyceriae*
Carex cuprina (I. Sandor ex Heuff.) Nendtv ex A. Kern.	*C. paniculatae*
Carex distans L.	*A. brevicornis*, *C. paniculatae*, *S. (R.) elegans*, *S. (R.) maydis*
Carex disticha Huds.	*A. serrulatus*, *C. paniculatae*
Carex divulsa Stokes	*A. serrulatus*, *C. paniculatae*
Carex elongata L.	*C. paniculatae*
Carex flava L.	*C. paniculatae*, *S. (S.) glyceriae*
Carex gynandra Schwein.	*S. (S.) glyceriae*
Carex hirta L.	*A. serrulatus*, *C. paniculatae*
Carex lamprophysa Sam. ex Nordh	*C. paniculatae*
Carex ligerica J. Gay	*C. paniculatae*
Carex muricata L.	*C. paniculatae*
Carex nigra Reichard	*A. serrulatus*
Carex otrubae Podp.	*C. paniculatae*
Carex ovalis Gooden.	*A. serrulatus*, *C. paniculatae*

Plant species	Siphini
Carex pachystylis J. Gay	*C. paniculatae*
Carex panicea L.	*S. (S.) glyceriae*
Carex paniculata L.	*C. paniculatae*
Carex praecox Schreb.	*S. (R.) praecocis*
Carex pseudocyperus L.	*S. (S.) glyceriae*
Carex recta Boot	*A. serrulatus*
Carex remota L.	*C. paniculatae*, *S. (S.) glyceriae*
Carex riparia Curtis	*C. paniculatae*
Carex rostrata Stokes	*C. paniculatae*, *S. (S.) glyceriae*
Carex sempervirens Vill.	*C. paniculatae*
Carex spicata Huds.	*C. paniculatae*
Carex straminea Willd. ex Schkuhr	*C. paniculatae*
Carex vesicaria L.	*A. serrulatus*
Carex vulpina L.	*C. paniculatae*
Carex sp.	*S. (S.) flava*, *S. (R.) maydis*
Cyperus longus subsp. *badius*	*S. (S.) glyceriae*
Cyperus sp.	*S. (S.) flava*
Eleocharis palustris (L.) Roem.&Schult.	*S. (S.) glyceriae*
Schoenoplectus maritimus (L.) Lye	*S. (S.) glyceriae*
Schoenus nigricans L.	*S. (S.) glyceriae*
unident. Cyperaceae	*A. persianus*
Juncaceae	
Juncus acutiflorus Ehrh. ex Hoffm.	*S. (R.) maydis*
Juncus articulatus L.	*A. hirtellus*, *S. (S.) glyceriae*
Juncus compressus Jacq.	*A. brevicornis*, *S. (R.) elegans*
Juncus conglomeratus L. emend. Leers	*S. (S.) glyceriae*
Juncus effusus L.	*S. (S.) glyceriae*, *C. paniculatae*
Juncus gerardii Loisel.	*A. serrulatus*, *S. (R.) maydis*
Juncus inflexus L.	*A. serrulatus*
Luzula sp.	*A. brevicornis*, *S. (R.) maydis*
Poaceae	
Achnatherum calamagrostis (L.) Beauv.	*Ch. stipae* subsp. *setosa*, *S. (R.) elegans*
Achnatherum (*Lasiagrostis*) *splendens* (Trin.) Nevsky	*A. karakumi*, *Ch. stipae*
Aegilops biuncialis Vis.	*S. (R.) elegans*
Aegilops crassa Boiss.	*S. (R.) elegans*
Aegilops cylindrica Host.	*S. (R.) elegans*
Aegilops geniculata Roth	*S. (R.) elegans*
Aegilops kotschyi Boiss.	*S. (R.) elegans*
Aegilops longissima Schweinf., Muschl.&Eig.	*S. (R.) maydis*
Aegilops peregrina (Hackel) Maire	*S. (R.) maydis*
Aegilops tauschii Coss.	*S. (R.) elegans*
Aegillops truncialis L.	*S. (R.) maydis*, *S. (R.) elegans*
Aegilops umbellulata Zhuk.	*S. (R.) elegans*
Aegilops ventricosa Tausch	*S. (R.) elegans*
Agropyron cristatum (L.) Gaertn.	*S. (R.) elegans*, *L. psammae*, *S. (R.) maydis*
Agropyron pectinatum (Bieb.) Beauv.	*S. (R.) elegans*, *S. (R.) maydis*
Agropyron trachycaulum (Link) Malte ex H.F. Lewis	*S. (R.) elegans*

Plant species	Siphini
Agropyron sp.	*S. (S.) agropyronensis*, *S. (S.) glyceriae*, *S. (R.) uvarovi*
Agrostis canina L.	*S. (S.) glyceriae*
Agrostis capillaris L.	*S. (S.) glyceriae*, *S. (R.) maydis*
Agrostis curtisii Kerguelen	*A. serrulatus*, *L. psammae*
Agrostis gigantea Roth	*S. (S.) glyceriae*
Agrostis repens Sincl.	*S. (R.) maydis*
Agrostis stolonifera L.	*A. serrulatus*, *L. psammae*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Aira caryophyllea L.	*Ch. berlesei*
Alopecurus aequalis Sobol.	*S. (S.) glyceriae*
Alopecurus geniculatus L.	*A. serrulatus*, *L. psammae*, *S. (S.) glyceriae*, *S. (R.) maydis*
Alopecurus pratensis L.	*A. hirtellus*, *A serrulatus*, *L. psammae*, *S. (R.) elegans*, *S. (R.) maydis*
Alopecurus sp.	*A. brevicornis*
Ammophila arenaria (L.) Link	*A. hirtellus*, *A. serrulatus*, *Ch. longirostris*, *Ch. stipae*, *L. psammae*, *S. (S.) glyceriae*, *S. (S.) littoralis*, *S. (R.) elegans*
Andropogon annulatus Forsk.	*S. (S.) flava*
Andropogon caricosus L.	*S. (S.) flava*
Andropogon sp.	*A. hirtellus*, *S. (R.) maydis*
Aneurolepidium chinense (Trin.) Kitag.	*S. (R.) elegans*
Anthoxanthum odoratum L.	*S. (R.) maydis*
Arrhenatherum album (Vahl.) W.D. Clayton	*S. (R.) maydis*
Arrhenatherum elatius (L.) P. Beauv. ex J.&C. Presl.	*A. hirtellus*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Arrhenatherum sp.	*A. serrulatus*, *L. psammae*
Arundo donax L.	*S. (R.) maydis*
Axonopus sp.	*S. (S.) flava*
Avena barbata Pott. ex Link.	*S. (R.) maydis*
Avena fatua L.	*S. (R.) maydis*
Avena ludoviciana Dur.	*S. (R.) arenarii*
Avena sativa L.	*S. (S.) flava*, *S. (R.) maydis*
Avena sterilis L.	*S. (R.) maydis*
Avena sp.	*Ch. stipae*
Avenula pratensis (L.) Dumort	*S. (R.) elegans*
Bothriochloa ischaemum (L.) Keng	*S. (S.) flava*, *S. (R.) maydis*
Bouteloua americana (L.) Scribn.	*S. (S.) flava*
Brachiaria sp.	*S. (S.) flava*
Brachypodium phoenicoides (L.) Roem.&Schult.	*S. (S.) flava*, *S. (R.) elegans*
Brachypodium pinnatum (L.) P. Beauv.	*S. (R.) maydis*
Brachypodium retusum (Pers.) Beauv.	*A. serrulatus*, *S. (R.) elegans*
Briza minor L.	*S. (R.) maydis*
Bromus arvensis L.	*S. (R.) maydis*
Bromus catharticus Vahl	*S. (R.) maydis*
Bromus biebersteinii Roem.&Schult.	*S. (S.) flava*
Bromus erectus Huds.	*S. (R.) elegans*, *S. (R.) maydis*
Bromus hordaceus L.	*S. (R.) maydis*
Bromus inermis Leyss.	*S. (R.) elegans*, *S. (R.) maydis*

Plant species	Siphini
Bromus madritensis L.	*S. (R.) maydis*
Bromus marginatus Nees ex Steud	*S. (S.) flava*
Bromus rigens L.	*S. (R.) maydis*
Bromus rigidus Roth.	*S. (R.) maydis*
Bromus scoparius L.	*S. (R.) maydis*
Bromus sterilis L.	*A. serrulatus*
Bromus wildenowii Kunth	*S. (R.) maydis*
Bromus villosus Scop.	*S. (R.) maydis*
Bromus sp.	*Ch. tshernavini*, *S. (S.) flava*
Calamagrostis arundinacea (L.) Roth.	*Ch. stipae* subsp. *setosa*, *L. psammae*
Calamagrostis epigejos (L.) Roth.	*A. serrulatus*, *L. psammae*, *S. (S.) glyceriae*, *S. (S.) littoralis*, *S. (R.) maydis*
Calamagrostis pseudophragmites (Haller f.) Koeler	*S. (R.) maydis*
Calamagrostis villosa (Chaix) J.F. Gmel.	*L. psammae*
Catabrosa aquatica (L.) P. Beauv.	*S. (S.) glyceriae*
Cenchrus brownii Roem.&Schult.	*S. (S.) flava*
Cenchrus pauciflorus Benth.	*S. (S.) flava*
Chloris sp.	*S. (S.) flava*
Chrysopogon gryllus (L.) Trin.	*S. (R.) elegans*, *S. (R.) maydis*
Cortaderia sp.	*S. (S.) flava*
Corynephorus canescens (L.) P. Beauv.	*A. serrulatus*, *Ch. berlesei*, *Ch. tshernavini*, *L. psammae*
Cutandia maritima (L.) W. Barbey	*S. (R.) maydis*
Cymbopogon citratus (DC. ex Nees) Staph	*S. (S.) flava*
Cynodon dactylon (L.) Pers.	*S. (S.) flava*, *S. (R.) maydis*
Cynosurus cristatus L.	*A. serrulatus*
Dactylis glomerata L.	*A. serrulatus*, *L. psammae*, *S. (S.) flava*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Danthonia sp.	*S. (S.) flava*
Deschamsia caespitosa (L.) P. Beauv.	*A. brevicornis*, *A. doncasteri*, *A. hirtellus*, *A. serrulatus*, *Ch. berlesei*, *L. psammae*, *S. (S.) glyceriae*
Deschampsia flexuosa (L.) Trin.	*A. doncasteri*, *A. serrulatus*, *Ch. berlesei*, *S. (R.) maydis*
Desmazeria marina (L.) Druce.	*S. (S.) glyceriae*
Digitaria decumbens Stent	*S. (S.) flava*
Digitaria ischaemum (Schreb.) H.L. Mühl.	*S. (R.) maydis*
Digitaria ciliaris (Retz.) Koeler	*S. (S.) flava*
Digitaria sanguinalis (L.) Scop	*S. (S.) flava*
Digitaria smutsii Stent	*S. (S.) flava*
Echinichloa crus-galli (L.) P. Beauv.	*S. (S.) flava*, *S. (R.) maydis*
Echinochloa frumentacea (Roxb.) Link.	*S. (S.) flava*
Eleusine coracana (L.) Gaertn.	*S. (R.) maydis*
Eleusine sp.	*S. (S.) flava*
Elymus dahuricus Turcz. ex Griseb.	*S. (R.) maydis*
Elymus hispidus (Opiz) Melderis	*S. (S.) agropyronensis*, *S. (R.) arenarii*, *S. (R.) elegans*, *S. (R.) maydis*
Elymua hispidus barbulatus (Schur) Melderis	*S. (R.) elegans*, *S. (R.) maydis*
Elymus pungens (Pers.) Melderis	*S. (R.) elegans*

Plant species	Siphini
Elymus repens (L.) Gould	*Ch. berlesei*, *L. psammae*, *S. (S.) glyceriae*, *S. (R.) burakowskii*, *S. (R.) elegans*, *S. (R.) maydis*
Elymus smithii (Rydb.) Gould.	*S. (S.) agropyronensis*
Elymus trachycaulus (Link) Gould ex Shinners	*S. (R.) elegans*
Elytrigia trichophora (Link) Nevski	*S. (R.) maydis*
Eragrostis sp.	*S. (S.) flava*, *S. (R.) maydis*
Eriochloa punctata (L.) Desv. ex Ham.	*S. (S.) flava*
Eulalia sp.	*S. (S.) flava*
Festuca arundinacea Schreb.	*S. (R.) elegans*
Festuca brachyphyla Schult.&Schult.	*S. (S.) glyceriae*
Festuca lanata L.	*A. serrulatus*
Festuca ovina L.	*A. brevicornis*, *A. karakumi*, *A. serrulatus*, *Ch. berlesei*, *Ch. tshernavini*, *S. (R.) elegans*, *S. (R.) maydis*, *S. (R.) uvarovi*
Festuca pallens Host	*A. serrulatus*, *Ch. berlesei*
Festuca pratensis Huds.	*A. serrulatus*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Festuca pseudovina Hack. ex Wiesb.	*A. serrulatus*
Festuca rubra L.	*A. brevicornis*, *A. serrulatus*, *Ch. berlesei*, *Ch. tshernavini*, *S. (S.) glyceriae*, *S. (S.) littoralis*, *S. (R.) elegans*, *S. (R.) maydis*
Festuca thallosica Kunth	*A. brevicornis*
Festuca trachyphylla (Hack.) Krajina	*A. serrulatus*, *Ch. berlesei*
Festuca sp.	*S. (S.) flava*
Glyceria declinata Breb.	*S. (S.) glyceriae*
Glyceria fluitans (L.) R. Br.	*L. psammae*, *S. (S.) glyceriae*
Glyceria maxima (Hartm.) Holmb.	*S. (S.) glyceriae*
Glyceria natans Kom.	*S. (S.) glyceriae*
Glyceria notata Chevall.	*S. (S.) glyceriae*
Glyceria striata (Lam.) Hitchc.	*S. (S.) glyceriae*
Holcus lanatus L.	*A. serrulatus*, *L. psammae*, *S. (R.) maydis*
Holcus mollis L.	*S. (S.) glyceriae*, *S. (R.) maydis*
Holcus sp.	*S. (S.) flava*
Hordeum brevisibulatum (Trin.) Link.	*S. (R.) elegans*
Hordeum brachyantherum Nevski	*S. (S.) glyceriae*
Hordeum bulbosum L.	*S. (R.) elegans*, *S. (R.) maydis*
Hordeum distichon L.	*S. (R.) maydis*
Hordeum jubatum L.	*S. (S.) glyceriae*, *S. (R.) elegans*
Hordeum murinum L.	*A. serrulatus*, *S. (R.) elegans*, *S. (R.) maydis*
Hordeum vulgare L.	*S. (S.) flava*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Hyparrhenia sp.	*S. (S.) flava*
Imperata cylindrica (L.) P. Beauv.	*S. (R.) maydis*
Koeleria macrantha (Ledeb.) Schult.	*L. psammae*
Koeleria phleoides (Vill.) Pers.	*S. (R.) maydis*
Lagurus ovatus L.	*S. (R.) maydis*
Leersia oryzoides (L.) Swartz	*S. (S.) glyceriae*
Leymus arenarius (L.) Hochst.	*A. hirtellus*, *A. serrulatus*, *L. psammae*, *S. (S.) glyceriae*, *S. (R.) arenarii*
Leymus chinensis (Trin.) Tzvel.	*S. (R.) burakowskii*

Plant species	Siphini
Leymus condensatus Presl.&C. Presl	*S. (R.) maydis*
Leymus racemosus (Lam.) Tzvel.	*S. (S.) glyceriae*, *S. (R.) taurica*
Leymus secalinus (Georgi) Tzvel.	*L. psammae*
Lolium multiflorum Lam.	*S. (R.) maydis*
Lolium perenne L.	*A. serrulatus*, *S. (R.) elegans*, *S. (R.) maydis*
Lolium rigidum Gaudin.	*S. (R.) maydis*
Lolium temulentum L.	*S. (R.) maydis*
Lolium sp.	*S. (S.) flava*
Luziola sp.	*S. (S.) glyceriae*
Melica sp.	*S. (S.) glyceriae*
Melinis sp.	*S. (S.) flava*
Miscanthus sinensis Anderss.	*S. (S.) flava*
Molinia caerulea (L.) Moench	*S. (S.) glyceriae*, *S. (R.) maydis*
Nardus sp.	*A. serrulatus*
Oryza sativa L.	*S. (S.) glyceriae*, *S. (S.) flava*, *S. (R.) maydis*
Panicum fasciculatum Sw.	*S. (S.) flava*
Panicum maximum Jacq.	*S. (S.) flava*
Panicum sp.	*L. psammae*, *S. (R.) elegans*
Paspalum conjugatum Berg.	*S. (S.) flava*
Paspalum dilatatum Poir.	*S. (S.) flava*
Paspalum melanosperum Desv. ex Poir.	*S. (S.) flava*
Paspalum paniculatum L.	*S. (S.) flava*
Paspalum paspalodes (Michx.) Scribn.	*S. (S.) glyceriae*
Pennisteum cladestinum Hochst. ex Chiov.	*S. (S.) flava*
Pennisetum ciliare (L.) Link.	*S. (S.) flava*
Pennisetum orientale L.C.Rich	*S. (S.) flava*
Pennisetum purpureum Schumach	*S. (S.) flava*
Pennisetum sp.	*S. (R.) maydis*
Phacelurus speciosus (Steud.) C.E. Hubb.	*S. (R.) elegans*, *S. (R.) maydis*
Phalaris arundinacea L.	*A. serrulatus*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Phalaris sp.	*S. (S.) flava*
Phleum commutatum Gaudin	*S. (R.) maydis*
Phleum phleoides (L.) H. Karst	*A. brevicornis*
Phleum pretense L.	*L. psammae*, *S. (S.) flava*, *S. (S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Phragmites australis (Cav.) Trin. ex Steud.	*S. (S.) glyceriae*, *S. (R.) maydis*
Poa alpina L.	*S. (R.) maydis*
Poa angustifolia L.	*A. serrulatus*, *S. (R.) maydis*
Poa annua L.	*A. serrulatus*, S. *(S.) glyceriae*, *S. (R.) elegans*, *S. (R.) maydis*
Poa aquatica L.	*S. (S.) glyceriae*
Poa compressa L.	*A. serrulatus*
Poa flabella (Lam.) Raspail.	*S. (S.) glyceriae*
Poa palustris L.	*S. (S.) glyceriae*
Poa pratensis L.	*A. hirtellus*, *A. serrulatus*, *S. (S.) flava*, *S. (S.) glyceriae*, *S. (R.) maydis*
Poa trivialis L.	*A. serrulatus*, *S. (R.) elegans*
Poa sp.	*Ch. berlesei*, *S. (R.) uvarowi*
Polypogon fugax Nees ex Steud.	*S. (R.) elegans*, *S. (R.) maydis*
Polypogon monspeliensis (L.) Desf.	*S. (R.) maydis*

Plant species	Siphini
Pucinella distans (Jacq.) Parl.	*A. brevicornis*, *S. (R.) elegans*
Puccinellia maritima (Huds.) Parl.	*A. brevicornis*, *A. serrulatus*, *S. (S.) glyceriae*, *S. (S.) littoralis*, *S. (R.) elegans*
Rorippa sylvestris (L.) Besser.	*S. (S.) glyceriae*
Rostraria cristata (L.) Tzvelev	*S. (R.) maydis*
Rhynchelthrum sp.	*S. (S.) flava*
Saccharum officinarum L.	*S. (S.) flava*, *S. (R.) maydis*
Saccharum ravennae (L.) Murray	*S. (R.) maydis*
Secale cereale L.	*S. (R.) elegans*, *S. (R.) maydis*
Secale sylvestre Host.	*S. (R.) maydis*
Setaria geniculata (Lam.) P. Beauv.	*S. (S.) flava*
Setaria italica (L.) P. Beauv.	*S. (S.) flava*, *S. (R.) elegans*
Setaria pumila (Poir.) Roem.&Schult.	*S. (S.) flava*, *S. (R.) elegans*, *S. (R.) maydis*
Setaria sphacelata (Schumach) Moss	*S. (S.) flava*
Setaria verticillata (L.) P. Beauv.	*S. (S.) flava*, *S. (R.) elegans*, *S. (R.) maydis*
Setaria viridis (L.) P. Beauv.	*S. (R.) elegans*, *S. (R.) maydis*
Setaria sp.	*L. psammae*
Sorghastrum sp.	*S. (S.) flava*
Sorghum bicolor (L.) Moench	*S. (S.) flava*, *S. (R.) maydis*
Sorghum halepense (L.) Pers.	*S. (S.) flava*, *S. (R.) maydis*
Sorghum sudanense (Piper) Stapf.	*S. (R.) elegans*
Sorghum vulgare Pers.	*S. (S.) flava*, *S. (R.) maydis*
Spartina maritima (Curt.) Fern.	*S. (S.) littoralis*
Spartina townsedii H.&J. Groves	*S. (S.) littoralis*
Sporobolus indicus (L.) R. Br.	*S. (S.) flava*
Stenotaphrum secundatum (Walt.) Kuntze	*S. (S.) flava*
Stipa capensis Thunb.	*S. (R.) maydis*
Stipa capillata L.	*Ch. massagetica*, *Ch. stipae*, *Ch. tshernavini*
Stipa dasyphylla (Lindem.) Trautv.	*Ch. stipae*
Stipa gigantea Link	*Ch. stipae*
Stipa joannis Celak.	*Ch. stipae*
Stipa kirghisorum P. Smirn	*Ch. stipae*
Stipa pennata L.	*Ch. stipae*
Stipa pennata subsp. *eriocaulis* (Borbas) Martin.&Skalicky	*Ch. stipae*
Stipa sareptana A.K. Becker	*Ch. stipae*
Stipa sibirica (L.) Lam.	*Ch. stipae*
Stipa sp.	*Ch. massagetica*, *Ch. stipae* subsp. *setosa*
Themeda triandra Forssk.	*S. (R.) maydis*
Tricholaena sp.	*S. (S.) flava*
Trisetum flavescens (L.) Beauv.	*Ch. stipae*, *S. (R.) maydis*
Trisetum koelerioides Bornm.&Hack.	*S. (R.) maydis*
Trisetum lineare (Forks.) Boiss	*S. (R.) maydis*
Trisetum sp.	*S. (R.) elegans*
Triticum aestivum L.	*L. psammae*, *S. (S.) flava*, *S. (R.) elegans*, *S. (R.) maydis*, *S. (R.) uvarovi*
Triticum baeoticum Boiss	*S. (R.) elegans*
Triticum dicoccon Schrank.	*S. (R.) maydis*
Triticum durum Desf.	*S. (R.) elegans*, *S. (R.) maydis*
Triticum sativum Lam.	*S. (R.) maydis*
Triticum spelta L.	*S. (R.) maydis*

Plant species	Siphini
Triticum turanicum Jakulz.	*S. (R.) elegans*, *S. (R.) maydis*
Triticum sp.	*S. (S.) glyceriae*
Vulpia geniculata (L.) Link	*S. (R.) maydis*
Vulpia myuros (L.) C.C. Gmel.	*S. (R.) maydis*
Zea mays L.	*S. (S.) flava*, *S. (S.) glyceriae*, *S. (R.) maydis*
Typhaceae	
Typha latifolia L.	*S. (S.) glyceriae*
Alismataceae *Sagittaria sagittifolia* L.	*S. (S.) glyceriae*
Caryophyllaceae — *Stellaria media* (L.) Vill.	*S. (R.) maydis*
Rutaceae — *Ptelea trifoliata* L.	*S. (R.) maydis*
Plumbaginaceae — *Acantholimon pamiricum* Czerniak.	*Ch. stipae*

References

ABASHIDZE A.T. 1951. Materialy k izučeniju afidofauny Gruzii. Soobšč. A.N. Gruz. SRR, 12 (7): 429—436.

ABDELMAJID N. 2008. Première apparition de Sipha flava (Homoptera, Aphididae) sur la canne à sucre au Maroc. Bull. OEPP, 38 (2): 220—222(3).

ACHREMOWICZ J. 1972. Mszyce (Homoptera, Aphidodea) Niziny Wielkopolsko-Kujawskiej. 2. Fragm. Faun. [Warszawa], 18: 361—392.

AGUIAR F., ILHARCO F.A. 2001. Aphids (Homoptera: Aphidoidea) from Madeira Island — new records and corrections. Bol. San. Veg. Plagas, 27: 325—336.

AKHMETIEV M.A., BENIAMOVSKI V.N. 2009. Paleogene floral assemblages around epicontinental seas and straits in Northern Central Eurasia: proxies for climatic and paleogeographic evolution. Geol. Acta, 7(1—2): 297—309.

ALBRECHT A. 2007. Atlas of the Aphids of Finland. www.fmnh.helsinki.fi/atlas.htm.

ALONSO J. 1968. El pulgon amarillo de la cana en la pangola y su control. Bibliogr. Agric. Ser. Nac., 5: 2—9.

ANDREEV A.B., VERESHAGIN B.V. 1993. Dopolnene k faune tlej (Homoptera, Aphidoidea) Respubliki Moldova. Vestn. Zool., 4: 16—19.

BAKER A.CH. 1920. Generic classification of the hemipterous family Aphididae. U.S. Dep. Agr. Bull., 826: 1—109.

BARANNIK A.P., NOVIKOV D.A. 1988. Materiały po faunie parazitov tlej centralnoy i jugo-zapadnoy Jakucii. In: Nasekomye biocenozov Jakucii. Ed. J.W. REVIN. Jakutsk, p. 77—81.

BARBAGALLO S., STROYAN H.L.G. 1980. Osservazioni biologiche, ecologiche e tassonomiche sull' afidofauna della Sicilia. Frustula Entomol., 3: 1—182.

BARBAGALLO S., PATTI I. 1994. Appuni faunistici sugli Afidi (Homoptera Aphidoidea) dell'Italia nord-orientale. Boll Zool Agr Bachic Ser. 2. 26 (1): 59—114.

BARBAGALLO S., BINAZZI A., BOLCHI-SERINI G., CONCI C., LONGO S., MAROTTA S., MARTELLI M., PATTI I., PELLIZZARI G., RAPISARDA C., RUSSO A., TRANFAGLIA A. 1995. Homoptera Sternorrhyncha. In: Checklist delle specie della fauna italiana. 43. Eds. A. MINELLI, S. RUFFO, S. LA POSTA. Bologna, Calderini, p. 1—57.

BLACKMAN R.L., EASTOP V.F 1994. Aphids on the World trees. An identification and Information guide. John Wiley&Sons, p. 1—446.

BLACKMAN R.L., EASTOP V.F. 2000. Aphids on the World's Crops: An Identification and Information Guide. 2nd Edition. John Wiley&Sons Ltd., England, p. 1—466.

BLACKMAN R.L., EASTOP V.F. 2006. Aphids on the World's Herbaceous Plants and Shrubs. Vol. 2. The Aphids. John Wiley&Sons Ltd. Natural History Museum, p. 1025—1439.

BLACKMAN R.L., EASTOP V.F. 2007. Taxonomic Issues. In: Aphids as Crop Pests. Eds. H. VAN EMDEN, R. HARRINGTON. CAB International, p. 1—30.

BLANCHARD E.E. 1939. Estudio systematico de los Afidoideos argentinos. Physis, 17: 857—1003.

BLANCHARD E.E. 1944. Descripciones y anotaciones de Afidoideos Argentinos. Acta Zool. Lilloana, (11): 15—62.

BLONSKA A. 2007. Fitosocjologiczne spektrum występowania Puccinellia distans (Poaceae) na siedliskach antropogenicznych Katowic. Fragm. Flor. Geobot. Polonica Suppl., 9: 83—96.

BOCHEN K., KLIMASZEWSKI S.M., WOJCIECHOWSKI W. 1975. Budowa męskiego układu rozrodczego Macrosiphoniella artemisiae (B. De Fonsc.) i M. millefolli (De Geer) (Homoptera, Aphididae). Acta Biol. [Katowice], 90: 73—81.

BODENHEIMER F.S., SWIRSKI E. 1957. The Aphidoidea of the Middle East. Jerusalem, The Weizmann Science Press of Israel, p. 1—371.

BORATYŃSKI A., BORATYŃSKA K. 1990. Systematyka i geograficzne rozmieszczenie. In: Wierzby Salix alba L., Salix fragilis L. Nasze Drzewa Leśne. Ed. S. BIAŁOBOK. Monografie Popularnonaukowe. Warszawa—Poznań, PWN, 13: 9—34.

BORCEA I. 1909. Contributiuni la Catalogul Aphidelor din Romania. Publ. Fond. Adamachi, Acad. Rom., Bucuresti, 5: 1— 42.

BOZHKO M.P. 1950. K faune tlej Oddeskoj Oblasti. Trudy nauč. Inst. Biol. Chark. Gos. Univ., 14—15: 225—232.

BOZHKO M.P. 1957a. K charakteristike fauny tlej (Aphidoidea) vostočnogo Predkavkaza. Trudy nauč. Inst. Biol. Fak. CHGU, 27: 39—50.

BOZHKO M.P. 1957b. Materialy k izučeniju fauny tlej (Aphidoidea) Kryma. Trudy Nauč. Inst. Biol. Chark. Gos. Univ., 30: 207—222.

BOZHKO M.P. 1957c. Materialy k poznaniju fauny tlej (Aphidoidea) pravoberežia Ukrainy i Moldavii. Trudy Nauč. Inst. Biol. Chark. Gos. Univ., 30: 223—240.

BOZHKO M.P. 1959. Fauna popelic (Aphidoidea) vydkrytych prostoryv pidvia evropeyskoy czastiny CPCP ta pinicznovo Kavkaza. Pr. Ent. Ukr., Kiev, p. 20—24.

BOZHKO M.P. 1961. New genus and species of Aphidoidea (Homoptera) from southern Ukraina, Moldavia and Ciscaucasia. Horae Soc. Entomol. Ross., 48: 5—37.

BÖRNER C. 1913. Aphidoiden. Aphididen, Blattläuse. In: Handbuch der Pflanzenkrankheiten. Ed. P. SORAUER. Berlin, 3: 654—683.

BÖRNER C. 1930. Beiträge zu einem neuen System der Blattläuse. Arch. Klassifikator. Phylogenet. Entomol., 1: 115—194.

BÖRNER C. 1939. Neue Gattungen und Arten der mitteleuropäischen Aphidenfauna. Arb. Physiol. Angew. Entomol. Berlin-Dahlem, 6 (1): 75—83.

BÖRNER C. 1944. III. Aphidoidea. In: Fauna von Deutschland, Ein Bestimmungsbuch unserer heimischen Tierwelt, Ed. P. BROHMER, p. 206—220. Verlag von Quelle and Meyer, Leipzig, viii + p. 584.

BÖRNER C. 1950. Neue europäische Blattlausarten. Naumburg, Selbstverlag, s. 1—19.

BÖRNER C. 1952. Europae Centralis Aphides. Die Blattläuse Mitteleuropas. Namen, Synonyme, Wirtspflanzen, Generationszyklen. Mitt. Thür. Bot. Ges., 3 (1): 1—484.

BÖRNER C., FRANZ H. 1956. Die Blättlause des Nordostalpengebietes und seines Vorlandes. Oesterr. Zool. Z., 6: 297—411.

CARTER C.I., WOOD-BAKER C.S., POLASZEK A. 1987. Species, host plants and distribution of aphids occurring in Ireland. Ir. Nat., 22 (7): 265—324.

CERMELI M.L. 1984. Claves para la identificacion de afidos capturados en trampas en Venezuela. FONAIAP, Serie AN, 2—20: 1—157.

CHAKRABARTI S. 1977. Chaitophorinae (Aphididae: Homoptera) of India with descriptions of three new species from north west India. Orient. Insect, 11 (2): 205—224.

CHAKRABARTI S., MANDAL K. 1986. An account of Trichaitophorus and Yamatochaitophorus (Homoptera: Aphididae) with a note on their phylogeny. Zool. J. Linn. Soc., 88: 329—338.

CORRALES C.E., CASTRO A.M., RICCI M., DIXON A.F.G. 2007. Sipha maydis: distribution and host range of a new aphid pest of winter cereals in Argentina. J. Econ. Entomol., 100 (6): 1781—1788.

COSTA ARBULU C., GIANOLI E., GONZALES W.L., NIEMEYER H.M. 2001. Feeding by the aphid Sipha flava produces a reddish spot on leaves of Sorghum halepense: an induced defense. J. Chem. Ecol., 27 (2): 273—283.

GOTLIN CULJAK T., IGRC BARCIC J. 2002. A Check—List of Aphid species superfamily Aphidoidea (Hemiptera, Homoptera, Sternorrhyncha) in Croatia. Nat. Croat., 11 (2): 243—264.

CULLINEY T.W., NAGAMINE W.T., TERAMOTO K.K. 2003. Introductions for biological control in Hawaii 1997—2001. Proc. Hawaii. Entomol. Soc., 36: 145—153.

CURTIS J. 1837. Homoptera. A guide to an arrangement of British insects; being a catalogue of all the named species hitherto discovered in Great Britain and Ireland. Second edition. London, Pigot and Co, p. 1—294.

CUSSET G. 1997. Botanique. Les Embryophytes. Paris, Masson, p. 1—512.

CZECHOWSKI W., MIKOŁAJCZYK W. 1981. Methods for the study of urban fauna. Memorabilia Zool., 34: 49—58.

CZYLOK A. 1987. Aphids (Homoptera, Aphidoidea) of plant communities in the Danube Delta. Acta Biol. Sil., 6 (23): 33—36.

DAHL F. 1912. Über die Fauna des Plagefenngebietes. In: Über die Faune des Plage-fenngebietes Ed. H. CONWENTZ. Berlin, Schnabelkerfe, Beitr. Naturdenkmalpfl., 3: 1—434.

DAVIS J.J. 1909. Biological Studies on three species of Aphididae. U.S. Dep. Agr. Bull. Entomol. Tech. Ser., 12 (8): 123—168.

DELFINO M.A. 2005. Inventario de las asociaciones afido-planta en Peru. Ecol. Apl., 4 (1—2): 143—158.

DEL GUERCIO G. 1900a. Prospetto dell' afidofauna italica. Nuove Relaz. Intorno Lav. R. Stn. Entomol. Agrar. Firenze, (1) 2: 1—236.

DEL GUERCIO G. 1900b. Sipha schoutedeni n. sp. In: Note sur les Hemipteres de Belgique. Ed. H. SCHOUTEDEN. Ann. Soc. Entomol. Belg., 44: 1—546.

DEL GUERCIO G. 1904. Resoconti dell'adunanza del 1 maggio 1904: Intorno ad una nuova specie di Sipha. Bull. Soc. Entomol. Ital., 36 (1—2): 1—12.

DEL GUERCIO G. 1905. Contribuzione alla conoscenza delle Sipha Pass. ed alla loro posizione nella famiglia degli afidi. Redia, 2: 127—152.

DI OLMI M., VILLANI A. 1975. Biologia dell'Afide italiano del riso Sipha glyceriae Klatenbach e metodi di lotta. Rivista il Riso. 25 (1): 59—71.

DIXON A.F.G., SHEARER J.W. 1974. Factors determining the distribution of the aphid Sipha kurdjumovi on grasses. Ent. Exp. Apll., 17: 439—444.

DÜRR H.J., VAN HEERDEN H.P. 1969. A list of unrecorded host plants of aphids in South Africa. Phytophylactica, 8: 79—82.

DZHIBLADZE A.A. 1958. Materialy k izuczeniju afidofauny Vostocznoj czasti Kahetii. Tr. Inst. Zool. [Tbilisi], 16: 291—321.

EASTOP V.F. 1953. A list of aphids collected in Guernsey, Herm and Sark. Entomol. Mon. Mag., 89: 154—155.

EASTOP V.F. 1962. A contribution to the aphid fauna. In: Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew. Ed. H.K. AIRY SHAW. Kew Bull., 16 (1): 139—146.

EASTOP V.F. 1965. A second contribution to the aphid fauna. In: Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew. Ed. H.K. AIRY SHAW. Kew Bull., 19 (3): 391—397.

EASTOP V.F. 1979. Sternorrhyncha as Angiosperm Taxonomist. Symb. Bot. Upsal., 22 (4): 120—134.

EASTOP V.F. 1986. The Systematics Assocations. Aphid-plant associations. In: Coevolution and Systematics. Eds. A.R. STONE, D.L. HAWKSWORTH. Oxford, Clarendon Press, p. 35—54.

EASTOP V.F., BLACKMAN R. 2005. Some new synonyms in Aphididae (Hemiptera: Sternorrhyncha). Zootaxa, 1089: 1—36.

EASTOP V.F., HILLE RIS LAMBERS D. 1976. Survey of the World's Aphids. The Hague, Junk, p. 1—573.

EASTOP V.F., TANASIJEVIĆ N. 1966. Aphid records from Yugoslavia. Entomol. Mon. Mag., 102: 55—57.

EVANS G.A., HALBERT S.E. 2007. A checklist of the aphids of Honduras (Hemiptera: Aphididae). Fla. Entomol., 90 (3): 518—524.

FALKOWSKI M. (ed.) 1982. Trawy polskie. Warszawa, Państwowe Wydawnictwo Rolnicze i Leśne, p. 1—565.

FANTA J. 2005. Forests and forest environments. In: The physical geography of western Europe. Ed. E.A KOSTER. New York, Oxford University Press Inc., p. 331—352.

FORBES S.A. 1884. Recent Observations. Plant-Lice — Aphides. Thirteenth Report of the State Entomologist on the Noxious and Beneficial Insects of the State of Illinois, May 31, p. 1—203.

FOTTIT R.G., RICHARDS W.R. 1993. The insects and arachnids of Canada. Part 22. The genera of the Aphids of Canada. Homoptera: Aphidoidea and Phylloxeroidea. Ottawa, Ontario, Agriculture Canada, p. 1—766.

FREY L. 2002. Taksonomia. In: Polska Księga Traw. Ed. L. FREY. Kraków, Instytut Botaniki im. W. Szafera, Polska Akademia Nauk, p. 57—74.

GHOSH A.K. 1980. The fauna of India and the Adjacent Countries. Homoptera, Aphidoidea. Part 1. General Introduction and sub-family Chaitophirinae. Calcutta, Zoological Survey of India, p. 1—124.

GILLETTE C.P. 1911. A new genus and four new species of Aphididae (Rhynch). Entomol. News, 22: 440—444.

GILLETTE C.P., PALMER M.A. 1931. The Aphidae of Colorado. Part 1. Ann. Entomol. Soc. Amer., 24: 827—934.

GLEISS H.G.W. 1967. Der derzeitige stand unseres wissens uber die blattlausfauna von Schleswig-Holstein und Hamburg (Homoptera; Aphidoidea). Faun.-Ökol. Mitt., 3 (3—4): 124—163.

Głowacka E., Klimaszewski S.M., Szelegiewicz H., Wojciechowski W. 1974a. Uber den Bau des mannlichen Fortpflanzungssystems der Lachniden (Homoptera, Aphidoidea). Ann. Zool. [Warszawa], 32: 39—49.

Głowacka E., Klimaszewski S.M., Szelegiewicz H., Wojciechowski W. 1974b. Uber den Bau des mannlichen Fortpflanzungssystems der Aphiden (Homoptera, Aphidoidea). Ann. UMCS, Sec. C. [Lublin], 29: 133—138.

Goloboff P. 1999. NONA (NO NAME) ver. 2 Published by the author. Tucumán, Argentina.

Gonzales W.L., Fuentes-Contreras E., Niemeyer H.M. 1998. Una nueva especie de afido (Hemiptera : Aphididae) decectada en Chile Sipha flava (Forbes). Rev. Chil. Entomol., 25: 87—90.

Gonzales W.L., Ramirez C.C., Olea N., Niemeyer H.M. 2002a. Host plant changes produced by the aphid Sipha flava : consequences for aphid feeding behaviour and growth. Entomol. Exp. Apll., 103: 107—113.

Gonzales W.L., Fuentes-Contreras E., Niemeyer H.M. 2002b. Host plant and natural enemy impact on cereal aphid competition in a seasonal environment. Oikos, 96: 481—491.

Van der Goot P. 1913. Zur Systematik der Aphiden. Tijdschr. Entomol., 56: 69—155.

Van der Goot P. 1915. Beiträge zur Kenntnis der Holländischen Blattläuse eine Morphologisch-Systematische Studie. Harlem, H.D. Tjeenk Willink and Zoon, p. 1—600.

Haliday A.H. 1839. New British Insects indicated in Mr. Curtis's Guide. Ann. Mag. Nat. Hist., 2 (9): 183—190.

Van Harten A. 1975. Notes on a small collection of Aphids from continental Portugal (Homoptera, Aphidoidea). Agron. Lusit., 36 (3): 217—225.

Heie O.E. 1980. The Aphidoidea (Hemiptera) of Fennoscandia and Denmark. 1. General Part. The families Mindaridae, Hormaphididae, Thelaxidae, Anoeciidae, and Pemphigidae. Klampenborg, Fauna Ent. Scand., Sciandinavian Science Press LTD, 9: 1—235.

Heie O.E. 1982. The Aphidoidea (Hemiptera) of Fennoscandia and Denmark. 2. The family Drepanosiphidae. Klampenborg, Fauna Ent. Scand., Sciandinavian Science Press LTD, 11: 1—175.

Heie O.E. 1987. Morphological structures and adaptations. In: Aphids, their biology, natural enemies and control. Eds. A.K. Minks, P. Harrewijn. Amsterdam, Elsevier, p. 392—400.

Heie O.E. 1995. An aphid from the Plio-Pleistocene Kobenhavn Formation, North Greenland (Homoptera, Aphidoidea). Ent. Meddr., 63 (1): 17—18.

Heie O.E. 1996. The evolutionary history of aphids and a hypothesis on the coevolution of aphids and plants. Boll. Zool. Agr. Bachic. Ser. 2, 28 (2): 149—155.

Heie O.E., Węgierek P. 2009. A classification of the Aphidomorpha (Hemiptra: Sternorrhyncha) under consideration of the fossil taxa. Redia, 92: 69—77.

Heikinheimo O. 1966. Für die finnische Fauna neue Blattläuse (Hom., Aphidoidea). 3. Ann. Entomol. Fenn., 32: 107.

Hentz M., Nuessly G. 2004. Development, longevity and fecundity of Sipha flava (Homoptera: Aphididae) feeding on Sorghum bicolor. Environ. Entomon., 33 (3): 546—553.

Hille Ris Lambers D. 1939. On some western European Aphids. Zoöl. Meded., 22: 81—120.

HILLE RIS LAMBERS D. 1947. Neue Blattläuse aus der Schweiz (I) (Homoptera, Aphidae). Mitt. Schweiz. Entomol. Ges., 20: 323—331.

HODJAT S.H. 1998. A list of Aphids and their host plants in Iran. Shahid-Chamran University Prining&Publishing Center, p. 1—148.

VAN DER HOEVEN 1863. Over een klein Hemipterum dat op de bladen van verschillende soorten van Acer gevonden wordt. Tijdschr. entomol., 6: 1—7.

HOLMAN J. 1995. Sternorrhyncha: Aphidinea. In: Terrestrial Invertebrates of the Palava Biosphere Reserve of UNESCO. 1. Eds. R. ROZKOSNY, J. VANHARA. Folia. Fac. Sci. Nat. Uni. Masaryk. Brun., Biol., 92: 189—200.

HOLMAN J. 2009. Host Plant Catalog of Aphids — Palaearctic Region. Springer Verlag, New York, p. 1—1216.

HOLMAN J., PINTERA A. 1977. Aphidodea. Acta Funistica Ent. Mus. Nat. Pragae, Suppl., 4: 101—116.

HOLMAN J., PINTERA A. 1981. Ubersicht der Blattläuse (Homoptera, Aphidoidea) der Rumanischen Sozialistischen Republik. Praha, Studie CSAV, 15: 1—125.

HOLMAN J., SZELEGIEWICZ H. 1972. Weitere Blattläuse (Homoptera, Aphidodea) aus der Mongolei. Fragm. Faun., 18 (1): 1—22.

HOLMAN J., SZELEGIEWICZ H. 1974. On some new and little known Mongolian aphids (Homoptera, Aphidodea). Ann. Zool., 32 (1): 1—17.

ILHARCO F.A. 1973. Catalogo dos afideos de Portugal continental. Oreiras, Estacao Agronomica Nacional, p. 1—134.

ILHARCO F.A. 1991—1995. 2nd aditamento ao catalogo dos afideos de Portugal Continental. Agron. Lusit., 45 (1—3): 5—66.

IVANOVSKAJA O.I. 1958. Fauna tlej (Aphidoidea) Centralnoj Kulundy. Izv. SO A.N. SSSR, 8: 126—133.

IVANOVSKAJA O.I. 1966. K faune tlej (Aphidoidea, Homoptera) Tuvy. In: Fauna i ekologija czlenistonogich Sibiri. Ed. A.I. CHEREPANOV. Nauka, Novosibirsk, p. 195—198.

IVANOVSKAJA O.I. 1972. Fauna tlej (Aphidoidea, Homoptera) Tuvy. In: Fauna i ekologija Centalnej Sibiri. Tr. USSR. Nowosibirsk, p. 19—24.

IVANOVSKAJA O.I. 1976. Fauna tlej zapadnoj Sibiri. Tr. Biol. Inst., 18: 175—188.

IVANOVSKAJA O.I. 1977. Tli zapadnoj Sibiri. 1. Adelgidae-Chaitophoridae. Nowosibirsk, Nauka, p. 1—272.

JACKSON D.J. 1922. Notes on aphides from Sutherland. Scott. Nat., 1: 51—59.

JIN H., PLAHA P., PARK J.Y., HONG C.P., LEE I.S., YANG Z.H., JIANG G.B., KWAK S.S., LIU S.K., LEE J.S., KIM Y.A., LIM Y.P. 2006. Comparative EST profiles of leaf and root of Leymus chinensis, a xerophilous grass adapted to high pH sodic soil. Plant Sci., 170 (6): 1081—1086.

JUCHNEVITSH L.A. 1960. Nowyje vidy tlej (Homoptera, Aphidoidea) z Yugo-Wostoka Kazakhstana. Tr. In. Zool. Kaz. CCP, 9: 218—222.

JUCHNEVITSH L.A. 1968. Tli (Homoptera, Aphidinea) wostocznovo Kazakhstana. In: Pest Insects of Agriculture and Forests of Kazakhstan. Ałma-Ata, Academy of Science of the Kazakh SSR, Proceedings of the Institute of Zoology, 30: 58—95.

JÖRG E., LAMPEL G. 1988. Xerothermophile Aphiden der Schweiz und agrenzender Gebiete mit besonderer Berücksichtigung des Kantons Wallis (Homoptera, Aphidina). Mitt. Schweiz. Entomol. Ges., 61: 43—88.

JÖRG E., LAMPEL G. 1990. Eastern elements in the Swiss aphid fauna (Xerothermophilous steppe inhabitants). Acta Phytopathol. Entomol. Hung., 25 (1—4): 351—363.

JURONIS V. 1984. 31 new to Lithuanian SSR aphid species found in 1981—1982. New and rare for the Lithuanian SSR insect species. Records and descriptions of 1984. Vilnius, p. 13—18.

KADYRBEKOV R.KH. 2002. Ecology faunistic revive of aphids (Homoptera, Aphidinea) in the Almaty Reserve. Tethys Entomol. Res., 4: 77—86.

KADYRBEKOV R.KH., RENXIN H., SHAO H. 2002. To aphid fauna (Homoptera, Aphididae) of Xinjiang-Uygur Region of China. Tethys Entomol. Res., 4: 13—32.

KADYRBEKOV R.KH. 2004. To the aphid fauna (Homoptera, Aphidinea) of the West Kazakhstan. Tethys Entomol. Res., 10: 5—8.

KADYRBEKOV R.KH. 2005. Tli roda Chaetosiphella (Homoptera, Aphididae, Chaitophorinae) s opisanem nowego vida. Zool. Ž., 84 (9): 1144—1146.

KALTENBACH J.H. 1843. Monographie der Familien der Pflanzenläuse. Aachen, p. 1—223.

KALTENGACH J.H. 1874. Die Pflanzenfeinde aus der Klasse der Insekten. Ein nach Pflanzenfamilien geordnetes Handbuch Sämmtlicher auf den einheimischen Pflanzen bischer beobachteten Insekten zum Gebrauch für Entomologen, Insektensammler, Botaniker, Landf und Forstwirhe und Gartenfreunde. Stuttgart, J. Hoffman, p. 1—848.

KELLOGG E.A. 2001. Evolutionary history of grasses. Pl. Physiol, 125: 1198—1205.

KINDLER S.D., DALRYMPLE R.L. 1999. Relative susceptibility of cereals and pasture grasses to the yellow sugarcane aphid (Homoptera: Aphididae). Journ. Agric. Urban Entomol., 16 (2): 113—122.

KIRKALDY G.W. 1905. Catalouge of the genera of the Hemipterous insects of the family Aphidae with their typical species, together with list of species described as a new from 1885 to 1905. Can. Entomol., 37: 414—420.

KLIMASZEWSKI S.M., SZELEGIEWICZ H., WOJCIECHOWSKI W. 1973. Uber den Bau des mannlichen Fortpflanzungssystems von Drepanosiphum platanoidis (Schr.) (Homoptera, Aphidoidea). Bull. Acad. Pol. Sci. Cl II, 21 [Warszawa], 10: 671—674.

KNOWLTON G.F. 1983. Aphids of Utah. Utah State Univ. Res. bull., 509: 1—155.

KOCH C.L. 1854—1857. Die Pflanzenlause Aphiden, getreu nach dem Leben abgebildet und beschrieben. 1—4. Nürnberg, p. 1—336.

KORNAŚ J., MEDWECKA-KORNAŚ A. 2002. Geografia roślin. Warszawa, PWN, p. 1—634.

LAING F. 1920. On the genus Atheroides Haliday (Aphidae). Entomol. Mon. Mag., 6: 38—45.

LAING F. 1921. On various genera of British Aphids. Entomol. Mon. Mag., 57: 118—127.

LAMPEL G., MEIER W. 2003. Fauna Helvetica 8. Hemiptera: Sternorrhyncha-Aphidina, Teil 1: Non-Aphididae. Centre suisse de cartographie de la faune Schweizerische Entomologische Gesellschaft. Neuchatel, p. 1—312.

LECLANT F. 1966. Contribution a L'etude des Aphidoidea du Languedoc Meridional. Premiere note. Ann. Soc. Hortic Hist. Nat. Hérault., 106 (2): 119—134.

LECLANT F. 1967. Contribution a L'etude des Aphidoidea du Languedoc Meridional. Deuxieme note. Ann. Soc. Hortic Hist. Nat. Hérault., 1: 38—45.

LECLANT F. 1968. Contribution a L'etude des Aphidoidea du Languedoc Meridional. Troisieme note. Ann. Soc. Hortic Hist. Nat. Hérault., 108 (3): 138—143.

LEONARD M.D. 1967. A list of the aphids of Cyprus (Homoptera: Aphididae). Proc. Entomol. Soc. Wash., 69 (3): 259—266.

Mahmood R., Poswal M.A., Shehzad A. 2002. Distribution, Host Range and Seasonal Abundance of Sipha Sp. (Homoptera: Aphididae) and Their Natural Enemies in Pakistan. Pak. J. Biol. Sci., 5 (1): 47—50.

Mamontova W.A. 1949. Tli (Aphidodea) Kenevskogo Biogeografičeskogo Zapovednika. Trudy Kaniv. Biogeogr. Zapov., 7: 87—116.

Mamontova W.A. 1953. Aphids of agricultural crops of the legally preserved forested steppes of the USSR. Kiev, Izd. Akad. Nauk Ukr. SSR, p. 1—73.

Mamontova W.A. 1955. Dendrophilous aphids of the Ukraine. Kiev, Academy of Sciences, Ukrainian SSR, p. 1—91.

Mamontova W.A. 1959. Grass aphids of the Ukraine. Kiev, Academy of Sciences, Ukrainian SSR, p. 1—93.

Mamontova-Solukha W.A. 1963. New data on the aphid fauna (Homoptera, Aphidoidea) of Ukraine. Acad. Sci. Ukrainian SSR, Prac. Inst. Zool., 19: 11—45.

Mamontova-Solukha W.A. 1964. Popielici ukrainskovo Polisja. Kiev, Naukova Dumka, 20: 52—71.

Martelli M. 1950. Contributi alla conoscenza dell'entomofauna del granofurco (Zea mays L.). 2. Aphidoidea. Redia, 35: 257—380.

Maw H.E.L., Fottit R.G., Hamilton K.G.A., Scudder G.G.E. 2000. Checklist of the Hemiptera of Canada and Alaska. Ottawa, NRC Research Press, p. 1—220.

Mazur M. 2001. Ryjkowce kserotermiczne Polski (Coleoptera: Nemonychidae, Attelabidae, Apionidae, Curculionidae). Studium Zoogeograficzne. In: Monografie Fauny Polski, Warszawa, Instytut Systematyki i Ewolucji Zwierząt PAN, 22: 1—378.

Meagher R.L., Wilson S.W., Blocker H.D., Eckel R.V.W., Pfannenstiel R.S. 1993. Homoptera associated with sugarcane fields in Texas. Fla. Entomol., 76 (3): 508—514.

Millar L.M. 1990. The Aphids (Homoptera: Aphidoidea) of South Africa. An Identification Guide. Entomol. Mem. [Pretoria], 78: 1—105.

Mimeur J.M. 1933. Aphididae du Maroc. Bull. Soc. Sci. Natur. Maroc, 13 (1—3): 104—108.

Mizianty M. 1995. Trawy — grupa roślin, która odniosła ewolucyjny sukces. Wiad. Bot., 39 (1/2): 59—70.

Mirek Z., Piekos-Mirkowa H., Zajac A., Zajac M. 2002. Flowering plants and pteridophytes of Poland. A checklist. Kraków, W. Szafer Institute of Botany, Polish Academy of Sciences, p. 1—442.

Mojski J.M. 1993. Europa w plejstocenie. Ewolucja środowiska przyrodniczego. Warszawa, Polska Agencja Ekologiczna, p. 1—333.

Yanez-Morales M.J., Peña-Martinez M.R. 1991. Afidos (Homoptera: Aphididae) de la planice huasteca, Mexico. Folia Entomol. Mex., 82: 69—82.

Moran N.A. 1988. The evolution of host-plant alternation in aphids: evidence for specialization as a dead end. Am. Nat. 132: 681—706.

Mordvilko A.K. 1921. Zlakovye tli (Aphidoidea). Izv. Petrogr. obl. St. Zašč. Rast., 3 (3): 1—72.

Mordvilko A.K. 1928. Aphidodea-Tli-1.In: Opredelitel nasekomych. Ed. I.N. Filipev. Moskva, Novaja derevnja, p. 163—204.

Mordvilko A.K. 1929. Food Plant Catalogue of the Aphididae of U.S.S.R. Leningrad, Works of Applied Entomology, 14 (1): 1—101.

MORDVILKO A.K. 1934. On the evolution of aphids. Arch. Naturgesch. [Leipzig], N.S., 3 (1): 1—60.

MORDVILKO A.K. 1948. Aphidodea-tli ili rastitelnye wszi. In: Opredelitel nasekomych evropejskoy časti CCCP. Ed. A. TARBINSKI. Moskva, p. 187—226.

MÜLLER F.P. 1964. Merkmale der in Mitteleuropa an Gramineen lebenden Blättlause (Homoptera, Aphididae). Wiss. Z. Univ. Rostock, Math.-nat. wiss. Reihe, 13 (2—3): 269—278.

MÜLLER F.P. 1969. Aphidina — Blattläuse, Aphiden. In: Exkursionsfauna von Deutschland, Insekten — Zweiter Halbband, Wirbellose II/2. Ed. E. STRESEMANN. Berlin, Volk und Wissen, p. 51—141.

NIETO NAFRIA J.M., MIER DURANTE M.P.1998. Hemiptera, Aphididae I. In: Fauna Ibérica. Eds. M.A. RAMOS, J. ALBA TERCEDOR, X. BELLES I ROS, J. GOSALBEZ I NOGUERA, A. GUERRA SIERRA, E. MACPHERSON MAYOL, F. MARTIN PIERA, J. SERRANO MARINO, J. TEMPLADO GONZALEZ. Madrid, Museo Nacional de Ciencias Naturales, CSIC, 11: 1—424.

NIETO NAFRIA J.M., DELFINO M.A., MIER DURANTE P.M. 1992. La Afidofauna de la Argentina. Leon, Universidad de Leon, p. 1—235.

NIETO NAFRIA J.M., LATTEUR G., MIER DURANTE M.P., TAHON J., PEREZ HIDALGO N., NICOLAS J. 1999. The aphids of Belgium. Parasitica, 55 (1): 1—39.

NARZIKULOV M.N. 1954. Tli Wachšskoj Doliny. Trudy A.N. Tadž. SSR, 15: 1—125.

NARZIKULOV M.N. 1962. Tli (Homoptera, Aphididae) Tadžikistana i sopredelnych respublik Srednej Azii. Fauna Tadžikskoj SSR [Dušanbe]. Izd. A.N. Tadž. SSR, 9: 1—272.

NARZIKULOV M.N. 1970. New data on the fauna and biology of aphids (Homoptera, Aphidinea) from Middle Asia. Entomol. Obozr., 49 (2): 360—369.

NARZIKULOV M.N., UMAROV SH. A. 1971. K faune tlej (Homoptera, Aphidinea) Afganistana. Izv. Akad. nauk Resp. Tadž, 4 (45): 94—99.

NAUMANN-ETIENNE K., REMAUDIERÉ G. 1995. A commented preliminary checklist of aphids (Homoptera, Aphididae) of Pakistan and their host plants. Parasitica, 51 (1): 1—61.

NEVSKI V.P. 1929. Aphids of Central Asia. Uzbekistan Plant. Protect. Exp. Sta., 16: 1—425.

NEVSKI V.P. 1949. Tli. Aphidodea. In: Vrednye živothye Srednej Azii. Ed. A.A. ŠTAKELBERG. Leningrad, Zool. Inst. AN SSSR, p. 119—307.

NEVSKI V.P. 1951. K poznaniju fauny tlej (Homoptera, Aphidoidea) Južnogo Kazachstana. Trudy Vsesoj. Ent. Obšč., 43: 37—64.

NICKEL H., REMANE R. 2002. Artenliste der Zikaden Deutschland, mit Angabe von Nährpflanzen, Nahrungsbreite Lebenszyklus, Areal und Gefahrdung (Hemiptera, Fulgoromorpha et Cicadomorpha). Beitr. Zikadenkd., 5: 27—64.

NIXON K.C. 1999—2002. WinClada ver. 1.0000. Published by the author, Ithaca, NY, USA.

NUESSLY G.S. 2008. Yellow sugarcane aphid Sipha flava (Forbes) (Insecta, Hemiptera: Aphididae). http://creatures.ifas.ufl.edu.

OLIVEIRA S.A., SOUZA B., AUAD A.M., DA SILVA D.M., SOUZA L.S., CARVALHO C.A. 2009. Development and reproduction od Sipha flava (Forbes) (Hemiptera: Aphididae) at different temperatures. Neotrop. Entomol., 38 (3): 311—316.

ORTEGO J. 1997. Pulgones de la Patagonia Argentyna con la descripcion de Aphis intrusa sp. n. (Homoptera, Aphididae). Rev. Fac. Agron. [La Plata], 102 (1): 59—79.

ORTEGO J., DIFABIO M.E., MIER DURANTE M.P. 2004. Nuevos registrom y actualizacion de la lista faunistica de los pulgones (Hemiptera: Aphididae) de la Argentina. Rev. Soc. Entomol. Argent., 63 (1—2): 19—30.

OSSIANNILSSON F. 1954. Four new Swedish aphids (Hemiptera, Homoptera) with description of a new genus. Entomol. Tidskr. Arg., 75: 117—127.

OSSIANNILSSON F. 1955. A new European Atheroides (Hem., Hom., Aphid.). With synonymic notes on Atheroides hirtellus Hal. Entomol. Ts. Arg. 76 (2—4): 128—130.

OSSIANNILSSON F. 1959. Contributions to the knowledge of Swedish aphids. List of species with find records and ecological notes. Lantbrukshögsk. Ann., 25: 375—527.

OSSIANNILSSON F. 1962. Hemipterfynd i Norge. Nor. entomol. tidsskr., 12 (1—2): 56—62.

OSSIANNILSSON F. 1969. Notes on some Swedish aphids (Hem. Aphidoidea). Opusc. Entomol., 34(1—2): 28—34.

ÖZDEMIR I., REMAUDIERÉ G., TOROS S., KILINCER N. 2005. New aphids records from Turkey including the description of a new Lachnus species (Hemiptera, Aphididae). Rev. Fr. Entomol., 27 (3): 97—102.

PAIK W.H. 1971. Corealachnus gen. nov. (Homoptera, Aphididae). Korean J. Entomol., 1 (1): 3—5.

PALMER M.A. 1952. Aphids of the Rocky Mountain Region. The Thomas Say Foundation, 5: 1—452.

PASSERINI G. 1860. Gli Afidi con un prospetto dei generi ed alcune specie nuove Italiane. Parma Tipografia Carmignani, p. 1—40.

PASTSHENKO W.F. 1988. Aphididae. In: Keys to the insects of the Far East of the USSR. Homoptera and Heteroptera. Ed. P.A. LEHR. Leningrad, Nauka Publishing House, p. 1—979.

PATH E.M. 1910. Four rare aphid genera from Maine. Maine Agr. Exp. Sta. Bull., 182: 241—248.

PATTI I., BARBAGALLO S. 1998. An approach to the knowledge on the Italian aphid fauna. In: Aphids in natural and managed ecosystems. Eds. J.M. NIETO NAFRIA, A.F.G. DIXON. Leon, Universidad de Leon, Spain, p. 397—405.

PEREZ HIDALGO N., BARTHOLDY L.M., NIETO NAFRIA J.M. 1998. Two new aphid records for South America and a list of aphids from Rio Grande do Sul State and Brazil. In: Aphids in natural and managed ecosystems. Eds. J.M. NIETO NAFRIA, A.F.G. DIXON. Leon, Universidad de Leon, (Spain), p. 407—415.

PETROVIC O. 1996. Aphids (Aphididae, Homoptera) on cereal crops. Rev. Res. Work Fac. Agric. [Beograd], 41 (2): 159—168.

PETROVIC O. 1998. Checklist of aphids (Homoptera, Aphididae) in Serbia. Acta Entomol. [Srbija], 3 (1—2): 9—42.

PINTERA A. 1959. Faunistic Contribution to the knowledge of Bulgarian aphids (Hom., Aphid). Čas. Českoslov. Spol. Entomol., 56 (1): 69—89.

PINTERA A. 1965. New Aphid species from Pannonian Region (Homoptera). Acta Ent. Bohemoslov., 62: 283—286.

PINTERA A., SZALAY-MARZSÓ L. 1962. Neuere Angaben zur Kenntnis der Blattlaus- (Aphidoidea) Fauna Ungarns. Acta Zool. Acad. Sci. Hung., 8 (1—2): 127—133.

PITA M.T, ILHARCO F.A. 1998. On the aphid fauna (Aphidoidea) of the Azores and Madeira Archipelagos and Continental Portugal. In: Aphids in natural and managed ecosystems. Eds. J.M. NIETO NAFRIA, A.F.G. DIXON. Leon, Universidad de Leon, Spain, p. 439—449.

PODBIELKOWSKI Z. 1977. Państwa roślinne kuli ziemskiej. Warszawa, Wydawnictwa Szkolne i Pedagogiczne, p. 1—204.

QIAO G.X., ZHANG G.X. 2002. Taxonomic study of the Chinese subfamily Atheroidinae (Homoptera: Aphidoidea). Dongwu fenlei xuebao, 27 (4): 756—767.

QUATTROCCHI U. 2006. CRC World Dictionary of Grasses. Boca Raton, Florida, CRC Press Taylor&Francis Group. Vol. 1: A—D: 1—716; Vol. 2: E—O: 1—1440; Vol. 3: P—Z: 1—2383.

QUEDNAU F.W. 1962. A list of aphids so far unrecorded from South Africa with description of two new species (Homoptera, Aphidoidea). S. Afr. J. Agr. Sci., 5 (2): 253—264.

QUEDNAU F.W. 2004. Atlas of the Drepanosiphine aphids of the world. Part 2: Panaphidini Oestlund, 1923 — Panaphidina Oestlund, 1923 (Hemiptera, Aphididae: Callaphidinae). American Entomological Institute, 72: 1—301.

QUEDNAU F.W. 2010. Atlas of the Drepanosiphine aphids of the world. Part III: Mindarinae Tullgren, 1909; Neophyllaphidinae Takahashi, 1921; Lizeriinae E. E. Blanchard, 1923; Pterastheniinae Remaudiere & Quednau, 1988; Macrophodaphidinae Zachvatkin & Aizenberg, 1960; Taiwanaphidinae Quednau & Remaudiere, Spicaphidinae Essig, 1953; Phyllaphidinae Herrich-Schaeffer in Koch, 1857; Israelaphidinae Ilharco, 1961; Saltusaphidinae Baker, 1920 (Hemiptera, Sternorrhyncha Aphididae). Memoirs of the American Entomological Institute, 83: 1—361.

RAKAUSKAS R., RUPAIS A., JURONIS V. 1992. The check list of Lithuanian Aphidodea. New and rare for Lithuania insect species. Records and descriptions of 1992. Inst. of Ecology, Lithuanian Entomol. Soc., Vilnius, 12: 83—100.

RAKAUSKAS R., HAVELKA J., BAŠILOV A. 2008. Contribution to the knowledge of the aphid (Hemiptera, Sternorrhyncha: Phylloxeroidea, Aphidoidea) fauna of the Curonian spit, Lithuania. Acta Zool. Lit., 18 (2): 98—105.

REMAUDIERE G. 1958. Aphidoidea. Faune terrestre et d'eau douce des Pyrenees-Orientales, p. 1—66.

REMAUDIERE G. 1982. Contribution a la connaissance des Aphides (Homoptera, Aphidoidea) de la Grece et description d'un Thelaxes nouveau. Extrait des Annales de l'Institut Phytopatologique Benauv., 13 (2): 99—119.

REMAUDIERE G., LATGE J.P., MICHEL M.F. 1980. Evolution des populations de pucerons du littoral de Basse-Normandie. Acta Ecologica/Ecologia Applicata, 1 (4): 341—355.

REMAUDIÈRE G., REMAUDIÈRE M. 1997. Catalogue of the world's Aphididae (Homoptera, Aphidoidea). Versailles, INRA Editions, p. 1—473.

REMAUDIÈRE G., TALHOUK K. 1999. Les Aphides du Liban et de la Syrie avec la description d'une nouvelle espece du genre Brachyunguis (Hemiptera, Aphididae). Parasitica, 55 (4): 149—183.

RENNER S.S., GRIMM G.W., SCHNEEWEISS G.M., STUESSY T.F., RICKLEFS R.E. 2008. Rooting and dating maples (Acer) with an uncorrelated-rates molecular clock: implications for North American/Asian disjunctions. Syst. Biol., 57 (5): 795—808.

REZWANI A. 1987. The Aphidoidea of the Teheran Province. Ent. Phyt. Appliq., 54 (1—2): 73—191.

RICHARDS W.R. 1972. The Chaitophorinae of Canada (Homoptera: Aphididae). The Entomological Society of Canada, Ottawa, 87: 1—109.

ROBERTI D. 1990—1991. Gli Afidi d'Italia (Homoptera, Aphidoidea). Bari, Entomologica, Industria Grafica Laterza, 25—26: 1—387.

ROBINSON A.G., BRADLEY G.A. 1968. A revised list of the aphids of Manitoba. Manitoba. Entomol., 2: 60—65.

RODRIGUES P., ILHARCO F.A., DA SILVA E.B., FRANCO J.C. 2006. Interactions between ground cover management, hedges and aphids in lemon orchards. In: Proceedeings of the International Conference Integrated Control in Citrus Fruit Crops. Ed. F. GARCIA-MARI. IOBC/WPRS Bull., 29 (3): 117—125.

ROYALTY N., FARRAR CH. A., PERRING T.M. 1993. Taxonomic guide to the alate aphids of inland-Valley and Colorado-Desert agriculture of southern California. Southwest. Entomol., 17: 1—25.

RUPAIS A. 1979. Faunistische neuentdeckungen in der fauna der blattlause Lettlands. Latv. Entomol., 2: 43—51.

RUPAIS A. 1989. The aphids (Aphidoidea) of Latvia. Riga, Zinatne, p. 1—331.

RUPAIS A., JURONIS V. 1984. New and rare aphid species in the east Baltic Region. Latv. Entomol., 27: 81—88.

RUSANOVA V.N. 1942. K poznaniju fauny tlej (Aphididae, Homoptera) Azerbejdžana. Trudy Azerb. Gos. Univ., 3 (1): 11—53.

RYSZKIEWICZ M. 1995. Ziemia i życie. Rozważania o ewolucji i ekologii. Warszawa, Prószyński i S-ka, p. 1—268.

SCHOUTEDEN H. 1906. Catalogue des Aphides de Belgique. Mem. Soc. Entomol. Belg., 12: 189—246.

SHAPOSHNIKOV G.KH. 1964. Suborder Aphidinea — Aphids. In: Keys to the Insects of the European part of the USSR I. Ed. G.YA. BEI-BIENKO. Moskwa—Leningrad, Nauka, p. 489—616.

SHAPOSHNIKOV G.KH. 1987. Evolutionary estimation of taxa. In: Aphids, their biology, natural enemies and control. Eds. A.K. MINKS, P. HARREWIJN. Amsterdam, Elsevier, p. 401—414.

SHAW M.W. 1964. A basic list of the Scottish Aphididae. Trans. Soc. Brit. Entomol., 16: 49—92.

SILVESTRI F. 1939. Compendio di Entomologia Applicata (Agraria-Forestale-Medica-Veterinaria) 1. Tipografia Bellavista, Portici, p. 1—974.

SKVORTSOV A.K. 1999. Willows of Russia and adjacent countries. Joensuu, 39: 1—307.

SMAILOVA N.E. 1971. Stacialnoe raspriedelenie tlej w Centralnom Kazachstanie. Tr. Inst. Zool. [Alma-Ata], 22: 21—23.

SMAILOVA N.E. 1980. Dopolnene k faune tlej (Homoptera, Aphididae) zapadnovo Kazachstana. Tr. Inst. Zool. [Alma-Ata], 39: 44—48.

SMITH C.F., MARTORELL L.F., PEREZ ESCOLAR M.E. 1963. Aphididae of Puerto Rico. Technical Paper 37, Rio Piedras Puerto Rico, Agricultural Experimental Station, p. 1—121.

SMITH C.F., GAUD S.M., MARTORELL L.F., PÉREZ-ESCOLAR M.E. 1971. Additions and Corrections to the Aphididae of Puerto Rico. J. Agric. Univ. P.R., 55: 192—258.

SMITH C.F., CERMELI M.M. 1979. An annotated list of Aphididae (Homoptera) of the Carribean Islands and South and Central America. Tech. Bull. N. Carol. Agric. Exp. Stn., 259: 1—131.

SMITH C.F., PARRON C.S. 1978. An annotated list of Aphididae (Homoptera) of North America. Tech. Bull. N. Carol. Agric. Exp. Stn., 255: 1—428.

SORENSEN J., CABRERA B., WATSON G. 2008. Significant records in entomology. Sipha maydis Passerini — Aphidoidea: Aphididae. In: California Pest and Disease Report. Ed. S. GAIMARI. Sacramento, CPPDR, 24: 9—11.

SOUSA-SILVA C.R., ILHARCO F.A. 1995. Afídeos do Brasil e suas plantas hospedeiras. UFSCar, São Carlos, p. 1—85.

STANLEY M.S. 2002. Historia Ziemi. Warszawa, Wydawnictwo Naukowe PWN, p. 1—705.

STARKS K.J., MIRKES K.A. 1979. Yellow Sugarcane Aphid: Resistance in Cereal Crops. J. Ecom. Entomol., 72: 486—488.

STEKOLSHCHIKOV A.V. 2005. The aphis (Homoptera, Aphidoidea) fauna of Astrakhan Province. Entomol. Obozr., 84 (2): 309—333.

STOETZEL M.B., HILBURN D.J. 1990. The aphids and Phylloxera of Bermuda (Homoptera: Aphididae and Pylloxeridae). Fla. Entomol., 73 (4): 627—643.

STROYAN H.L.G. 1955. Recent additions to the British aphid fauna. Part 2. Trans. R. Entomol. Soc. Lond., 106 (7): 283—340.

STROYAN H.L.G. 1969. On a collection of aphids from Inverness-shire with the description of a new species. Trans. Soc. Brit. Entomol., 18: 227—246.

STROYAN H.L.G. 1976. A supplement to the Scottish aphid fauna. Glasg. Nat., 19: 235—258.

STROYAN H.L.G. 1977. Homoptera Aphidoidea, Chaitophoridae and Callaphididae. Handbooks for the Indentification of British aphids. Royal Entomological Society of London, 2 (4a): 1—129.

SZELEGIEWICZ H. 1961. Die polnischen Arten der Gattung Chaitophorus Koch s. lat. (Homoptera, Aphididae). Ann. Zool. [Warszawa], 19: 229—352.

SZELEGIEWICZ H. 1966. Erganzungen zur Blattlaus-Fauna (Homoptera: Aphididae) von Ungarn. Acta Zool. Acad. Sci. Hung., 12 (1—2): 181—192.

SZELEGIEWICZ H. 1968. Faunistische Ubersicht der Aphidoidea (Homoptera) von Ungarn. Fragm. Faun. [Warszawa], 15 (7): 57—98.

SZELEGIEWICZ H. 1974. Materiały do fauny mszyc (Homoptera, Aphidoidea) Polski. 2. Rodzina Chaitophoridae. Fragm. Faun. [Warszawa], 19: 285—317.

SZELEGIEWICZ H. 1977. Leveltetvek I. — Aphidinea I. Chaitophorinae, Callaphidinae. Fauna Hung., 17 (18): 1—175.

SZELEGIEWICZ H. 1981. The aphids (Homoptera, Aphidoidea) of the Hortobagy. The Fauna of the Hortobagy National Park. Budapest, Akademia Kiado, p. 77—87.

SZELEGIEWICZ H. 1985. Klucze do oznaczania owadów Polski (Homoptera, Aphidodea), Chaitophoridae. Warszawa, PWN, 17 (5b): 1—57.

ŚWIDZIŃSKA M. 1998. Wielka encyklopedia przyrody. Rośliny kwiatowe. 2. Warszawa, Muza S.A., p. 1—565.

TAMBS-LYCHE H., HEIE O.E. 1994. Studies on Norwegian aphids (Homoptera, Aphidoidea). 3. Fauna Norv. Ser. B., 41: 65—84.

TANASIJEVIĆ N., EASTOP V.F. 1963. Aphids Records from Yugoslavia. Entomologist, 96: 265—269.

TAO CH.CH. 1999. List of Aphidoidea (Homoptera) of China. Taiwan Agric. Res. Inst., 77: 1—144.

TASHEV D.G. 1964. Prinos km afidofaunata na Bulgarija. Bull. Instit. Zool. Mus., 16: 161—164.

TASHEV D.G. 1966. Listni vški (Homoptera, Aphidodea) ot Trakija. In: Die Fauna Thrakiens. Ed. A.K. VLAKOV. Sofia, Bulgarische Akademie der Wissenchaften, 3: 37—69.

TASHEV D.G. 1984. A list of aphids of Bulgaria. Kn. 1. God. Sofij. Univ., Biol. fak., Zool., 1: 21—35.

THEOBALD F.V. 1918. Notes on new and little known British aphides. 4. Entomologist, 51: 25—29.

THEOBALD F. V. 1922. A new aphid genus and species found in England. Bull. Entomol. Res., 12: 429, 430.

THEOBALD F.V. 1929. The plant lice or Aphididae of Great Britain. London, Headley Brothers, 3: 1—364.

TSITSIPIS J.A., KATIS N.I., MARGARITOPULOS J.T., LYKOURESSIS D.P., AVGELIS A.D., GARGALIANOU I., ZARPAS K.D., PERDIKIS D.CH., PAPANAYOTOU A. 2007. A contribution to the aphid fauna of Greece. Bull. Insectology, 60 (1): 31—38.

TUATAY N., REMAUDIÉRE G. 1964. Première contribution au catalogue des Aphididae (Hom.) de la Turquie. Rev. Pathol. Vég. Entomol. Agr. France, 43 (4): 243—278.

VELICHKO A., SPASSKAYA I. 2002. Climatic change and the development of landscapes. In: The physical geography of northern Eurasia. Ed. M. SHAHGEDANOVA. New York, Oxford University Press Inc, p. 36—70.

VERESCAGIN G.B., ANDREEV A.B., VERESCAGINA A.B. 1985. Tli Moldavii. Akad. Sci. Mold. SSSR, Kiszyniów, Sztinica, p. 1—158.

WAHLGREN E. 1955. Aphidologiska notiser. Opusc. Entomol., 20: 1—9.

WALKER F. 1848. Descriptions of Aphides. Ann. Mag. Natur. Hist., 2 (2): 43—48.

WEIS S. 1955. Die Blattläuse Oberösterreichs (Homoptera, Aphidoidea). Oesterr. Zool. Z. [Vien, Springer-Verlang], 5 (4): 464—559.

WERDER A.O. 1931. Beitrag zur Kenntnis der Aphiden-Fauna von Basel und Umgebung. Verhandl. Naturforsch. Ges., Basel, 42: 1—98.

WIECZOREK K. 2006—2007. The faunistic review of the Polish species of the subfamily Chaitophorinae (Hemiptera, Aphidoidea). Part 2 — tribe Atheroidini. Acta Entomol. Sil., 14—15: 21—27.

WIECZOREK K. 2006. Anatomical investigations of the male reproductive system of five species of Calaphidinae (Hemiptera, Aphidoidea). Insect Syst. Evol., 37: 457—465.

WIECZOREK K. 2008. Structure of the male reproductive system of Anoecia (Anoecia) corni Fabricius, 1775 (Hemiptera, Aphidoidea), a representative of the family Anoeciidae. Acta Zool. [Stockholm], 89: 163—167.

WIECZOREK K. 2008. Review of the genus Chaetosiphella Hille Ris Lambers, 1939 (Hemiptera, Aphididae: Chaitophorinae). Insect Syst. Evol., 39 (3): 327—340.

WIECZOREK K. 2009. A revision of the genus Atheroides Haliday, 1839 (Hemiptera, Aphididae: Chaitophorinae). Zool. Stud., 48 (5): 693—708.

WIECZOREK K., KAJTOCH Ł. Relationships within Siphini (Hemiptera, Aphidoidea: Chaitophorinae) in the light of molecular and morphological research. Sys. Entomol. (2010), DOI: 10.1111/j.1365-3113.2010.00550.x

WIECZOREK K., ŚWIĄTEK P. 2008. Morphology and ultrastructure of the male reproductive system of the woolly beech aphid Phyllaphis fagi (Hemiptera, Aphidoidea: Phyllaphidinae). Eur. J. Entomol., 105 (4): 707—712.

WIECZOREK K., ŚWIĄTEK P. 2009. Comparative study of the structure of the male reproductive system of monoecius and heteroecius aphid species Glyphina betulae and Anoecia (Anoecia) corni (Hemiptera, Aphididae). Zool. Anz., 248: 153—159.

WIECZOREK K., WOJCIECHOWSKI W. 2004. The systematic position of Chaitophorinae (Hemiptera, Aphidoidea) in the light of anatomy research. Insect Syst. Evol., 35: 317—327.

WOJCIECHOWSKI W. 1977. Procesy oligomeryzacji w budowie męskiego układu rozrodczego miodownic (Homoptera, Lachnidae). Acta Biol. [Katowice], 3: 140—164.

WOJCIECHOWSKI W. 1992. Studies on the systematic system of aphids (Homoptera, Aphidinea). Katowice, Uniwersytet Śląski, p. 1—75.

WOJCIECHOWSKI W. 2003. A monograph of the Palaearctic Pterocommatinae (Aphididae, Aphidinea, Hemiptera). Katowice, Uniwersytet Śląski, p. 1—112.

WOLFE J.A., TANAI T. 1987. Systematics, phylogeny, and distribution of Acer in the Cenozoic of western North America. J. Fac. Sci. Hokkaido Univ. 4: Geol. and Mineral., 22: 1—246.

WOOD-BAKER C.S. 1943—1944. A new species of Irish Aphid Trilobaphis rhodolested sp. nov., with artificial key (partial) to apterae of Irish Aphididae. Proc. R. Ir. Acad., (B), 49: 121—141.

WOOD-BAKER C.S. 1953. Records of forty two European aphids (Hemiptera). Entomol. Mon. Mag., 89: 68—72.

WOOD-BAKER C.S. 1955. Records of European Aphids. Entomol. Mon. Mag., 91: 147—153.

WOOD-BAKER C.S. 1964. Records of sixty-six European and British aphids (Hemiptera, Aphidoidea). Entomol. Mon. Mag., 25: 43—48.

WOOD-BAKER C.S., HOPKINS G.W. 1998. The oviparous female of Laingia psammae Theobald 1922 (Hem., Aphididae). Entomol. Mon. Mag., 134: 271.

YANO K., MIYAKE T., EASTOP V.F. 1983. The biology and economic importance of rice aphids (Hemiptera: Aphididae): a Review. Bull. Entomol. Res., 73: 539—566.

ZAJĄC M., ZAJĄC A. 2002. Fitogeografia. In: Polska Księga Traw. Ed. L. FREY. Kraków, Szafer Institute of Botany Polish Academy of Science, p. 125—139.

ZARZYCKI K., TRZCIŃSKA-TACIK H., RÓŻAŃSKI W., SZELĄG Z., WOŁEK J., KORZENIAK U. 2002. Ekologiczne liczby wskaźnikowe roślin naczyniowych Polski. Kraków, Szafer Institute of Botany Polish Academy of Science, p. 1—183.

ZHANG G., HONG Y. 1999. A new family Drepanochaitophoridae (Homoptera: Aphidoidea) from eocene Fushun amber of Liaoning Province, China. Entomol. Sin., 6 (2): 127—134.

VON ZIRNITS J. 1927. Beiträge zur Kenntnis der Aphiden Lettlands. Zeitschrift für wiss. Ins-Biologie, 22: 244—256.

Karina Wieczorek

Monografia Siphini Mordvilko, 1928 (Hemiptera, Ahpidoidea: Chaitophorinae)

S t r e s z c z e n i e

Monografia Siphini Mordvilko, 1928 przedstawia charakterystykę 5 rodzajów, 24 gatunków i 1 podgatunku mszyc należących do tego plemienia. Dla 69 morf (bezskrzydłej dzieworodnej samicy, uskrzydlonej dzieworodnej samicy, jajorodnej samicy, samca) przedstawiono deskrypcje lub redeskrypcje oraz klucze do oznaczania wszystkich znanych gatunków i morf.

Sipha (Rungsia) aegilopis Bozhko, 1961 zsynonimizowano z *Sipha (Rungsia) elegans* Del Guercio, 1905.

Dla *Sipha (R.) elegans* wyznaczono lektotyp.

Dla większości gatunków podano nowe stanowiska, na których zostały zaobserwowane, a dla 6 spośród nich (*Atheroides serrulatus* Haliday, 1839; *Chaetosiphella stipae* Hille Ris Lambers, 1947; *Laingia psammae* Theobald, 1922; *Sipha (Rungsia) arenarii* Mordvilko, 1921; *S. (R.) elegans* oraz *S. (R.) maydis* Passerini, 1860) nowe dane bionomiczne. Podczas badań terenowych po raz pierwszy zebrano i opisano jajorodną samicę i samca *Ch. stipae*. Na podstawie cytowanego piśmiennictwa oraz niepublikowanych danych przedstawiono również alfabetyczny wykaz roślin żywicielskich Siphini.

W technice mikroskopii świetlnej i transmisyjnej mikroskopii elektronowej analizowano budowę męskiego układu rozrodczego *A. serrulatus*, *Ch. stipae*, *L. psammae*, *S. (R.) arenarii*, *S. (R.) elegans* i *S. (R.) maydis*, natomiast w technice mikroskopii skaningowej — budowę zewnętrzną *A. serrulatus*, *Caricosipha paniculatae* Börner, 1939, *Ch. stipae* i *S. (R.) maydis*.

Przedstawiono i podsumowano wszystkie dostępne dane z zakresu chorologii, ekologii i bionomii, jak również odtworzono strukturę pokrewieństwa wśród Siphini oraz zaproponowano hipotezę pochodzenia tej grupy mszyc.

Słowa klucze: Taksonomia, Hemiptera, Aphidoidea, Chaitophorinae, Siphini.

Karina Wieczorek

Monografía de los Siphini Mordvilko, 1928 (Hemiptera, Ahpidoidea: Chaitophorinae)

R e s u m e n

En esta monografía se tratan y discuten detenidamente 5 géneros, 24 especies y 1 subespecie de la tribu Siphini Mordvilko, 1928. Se describen o redescriben y se dibujan 69 formas (hembras vivíparas ápteras, hembras vivíparas aladas, hembras ovíparas, machos). Se ofrecen también claves para el reconocimiento de las especies conocidas.

Se propone la sinonimia de *Sipha* (*Rungsia*) *aegilopis* Bozhko, 1961 (nombre inválido subjetivo) con *Sipha (Rungsia) elegans* Del Guercio, 1905.

Se designan el lectotipo de *Sipha* (Rungsia) *elegans*.

Se aportan primeras citas para varios países de muchas especies y se aportan datos bionómicos nuevos de seis especies (*Atheroides serrulatus* Haliday, 1839; *Chaetosiphella stipae* Hille Ris Lambers, 1947; *Laingia psammae* Theobald, 1922; *Sipha* (Rungsia) *arenarii* Mordvilko, 1921; *S. (R) elegans* and *S. (R) maydis* Passerini, 1860), describiéndose por vez primera los sexuados de *Ch. stipae*, que habían sido recolectados en el transcurso del estudio. Se presenta un índice de las planta hospedadoras, compilado a partir de la bibliografía que se ha utilizado.

Se presenta un estudio microscópico (óptico de campo claro y electrónico) del aparato reproductivo de los machos de *A. serrulatus*, *Ch. stipae*, *L. psammae*, *S. (R) arenarii*, *S. (R) elegans* and *S. (R) maydis*. También se presentan informaciones de otros caracteres morfológicos obtenidas mediante microscopía electrónica de *A. serrulatus*, *Caricosipha paniculatae* Börner, 1939, *Ch. stipae* and *S. (R) maydis*.

Se presenta una compilación de los datos conocidos sobre la corología, ecología y bionomía de las especies de la tribu.

Se presenta una propuesta sobre el origen evolutivo y las relaciones filogenéticas de este grupo de pulgones.

Palabras clave: Taxonomía, Hemiptera, Aphidoidea, Chaitophorinae, Siphini.

Redaktorzy: Barbara Todos-Burny, Krystian Wojcieszuk

Projektant okładki i stron działowych: Tomasz Gut

Redaktor techniczny: Barbara Arenhövel

Korektor: Sabina Stencel

ISSN 0208-6336
ISBN 978-83-226-1966-7

Wydawca
Wydawnictwo Uniwersytetu Śląskiego
ul. Bankowa 12B, 40-007 Katowice
www.wydawnictwo.us.edu.pl
e-mail: wydawus@us.edu.pl

Wydanie I. Ark. druk. 19,0. Ark. wyd. 23,0.
Papier offset. kl. III, 90 g Cena 32 zł

Łamanie: Pracownia Składu Komputerowego
Wydawnictwa Uniwersytetu Śląskiego
Druk i oprawa: PPHU TOTEM s.c.
M. Rejnowski, J. Zamiara
ul. Jacewska 89, 88-100 Inowrocław

Cena 32 zł

ISSN 0208-6336
ISBN 978-83-226-1966-7